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(71)Applicant : LDT GMBH & CO LASER DISPLAY TECHNOL KG
(72)Inventor : DETER CHRISTHARD

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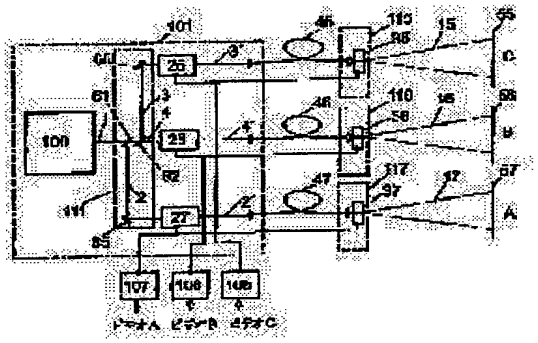
(54) VIDEO PROJECTING SYSTEM FOR PROJECTING PLURAL PICTURES

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a video projecting system for projecting plural pictures respectively having the same properties in terms of luminance, contrast, and color reproduction.
SOLUTION: The respective video projecting systems have spatial optical flux modulating means 35, 36 and 37, and the specified number of projectors 115, 116 and 117 corresponding to the number of individual pictures 55, 56 and 57, and the respective means are optically connected to a light source 100. A means 111 for dividing a luminous flux 1 into the specified number of partial luminous fluxes 2, 3 and 4 corresponding to the number of projectors is arranged behind the light source 100 on an optical path. Intensity modulating means 25, 26 and 27 are arranged on the partial optical paths 15, 16 and 17 of the respective partial luminous fluxes, and the intensity modulating means and the spatial luminous flux modulating means are arranged on one of the partial optical paths and also controlled by the signals A, B and C of video sources 105, 106 and 107.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The light source which generates at least one flux of light, and the means for the means for the intensity modulation controlled by the video signal, and a spatial flux of light modulation, In the video projection system by which at least one plane of incidence for projecting a predetermined number of each images has been arranged along the travelling direction of light on an optical path The image of each [system / video projection] of said predetermined number Are the projector (115-117;215-217;315-317) of the predetermined number corresponding to (55, 56, 57), and it has the projector (115-117;215-217;315-317) with which each has a spatial flux of light modulation means (35, 36, 37). This spatial flux of light modulation means (35, 36, 37) is optically connected to the light source (100; 200; 300; 400; 500; 600). Furthermore, the means (111; 211; 311; 411; 511; 611) for dividing the flux of light (1) into the partial flux of light (2, 3, 4) of the predetermined number corresponding to the projector of said predetermined number is arranged in accordance with an optical path on the lower stream of a river of the light source (100; 200; 300; 400; 500; 600). Each partial flux of light (2, 3, 4) has a partial optical path, and the means for intensity modulation (25, 26, 27) is arranged on each partial optical path. Said intensity modulation means (25, 26, 27) arranged one of these the partial optical paths (15, 16, 17), and said spatial flux of light modulation means (35, 36, 37) with the signal (A, B, C) of the video source (105,106,107) The video projection system characterized by being controlled.
[Claim 2] The means (111) for dividing said flux of light is a video projection system according to claim 1 which consists of a half mirror, a color mirror, a splitter cube, a diffraction grating, or a polarizer, and is characterized by dividing said partial flux of light based on reinforcement, a phase location, the polarization direction, or wavelength.
[Claim 3] the means for said intensity modulation (25) be a video projection system according to claim 1 or 2 characterize by realize with the LCD matrix and DMD array which be the same as that of the means for said spatial flux of light modulation (35), and emit light passively [these means form each image on the internal objective plane of each projector (215,216,217), and], or other image sources.
[Claim 4] Each image formed on the internal objective plane of a projector (215,216,217) is a video projection system according to claim 3 characterized by carrying out image formation on a plane of incidence with a projection objective lens (85, 86, 87).
[Claim 5] It is the video projection system according to claim 3 which the expansion element (225,226,227) of the predetermined number corresponding to the projector of said predetermined number is arranged after said division means (211) on the partial flux of light of each flux of light (2, 3, 4), and is characterized by said each expansion element (225,226,227) expanding the partial flux of light even to the magnitude of the internal objective plane of each projector (215,216,217).

[Claim 6] The means for said spatial flux of light modulation (35, 36, 37) is a video projection system given in claim 1 characterized by including the biaxial actuation deviation system which forms each image on a plane of incidence while deflecting each partial flux of light to two-dimensional thru/or any 1 term of 5.
[Claim 7] Said biaxial deviation system is a video projection system according to claim 6

characterized by consisting of tilt mirrors for performing a frame deviation with the polygon mirror for performing the Rhine deviation, or coming to arrange said means to a duplex.
[Claim 8] The means for said intensity modulation (25) is a video projection system according to claim 6 characterized by being an electrooptical modulator or an acoustooptic modulator.
[Claim 9] Said light source (100) is a video projection system given in claim 1 characterized by being the radiation source which has the optical intensity–distribution curve to which the temperature radiator or the luminous–radiation object was expanded especially spatially thru/or any 1 term of 8.
[Claim 10] For said light source (100), this especially radiation source is a video projection system given in claim 1 characterized by being the laser light source which has the property that are the radiation source which emits the collinear flux of light, and emission of the flux of light is restricted by diffraction thru/or any 1 term of 8.
[Claim 11] The optical path of the flux of light (1) containing the primary color of red, green, and blue is formed after the light source (300), Said division means is arranged on this optical path, and said flux of light (1) is divided into the partial flux of light of the predetermined number corresponding to the projector of said predetermined number, and each of these partial flux of lights is divided into the three further partial flux of lights, this — it having a partial optical path, while the three partial flux of lights contain one of the primary colors of red, green, and blue, respectively, and with an intensity modulation means being arranged on each partial optical path (8, 10, 11) Each of three partial optical paths to which it is shown to one of red, green, and the partial flux of lights that are one of the blue primary colors is assigned to one of the projectors (315,316,317,318), this — a video projection system given in claim 1 characterized by controlling said intensity modulation means arranged on three partial optical paths by the color video signal (A, B, C, D) from the video source (105,106,107,108) thru/or any 1 term of 10.
[Claim 12] Red, green, and the optical path separated spatially [the flux of light (R G, B) of blue primary color] follow the light source, The means (411) for dividing the flux of light (R, G, B) of these three books is arranged on said three optical paths. This division means divides each of said three flux of lights into the partial flux of light of the predetermined number corresponding to the projector of said predetermined number, each partial flux of light has a partial optical path, and the means for intensity modulation is arranged on each partial optical path (8, 10, 11), Each of three partial optical paths to which it is shown to one of red, green, and the partial flux of lights that are one of the blue primary colors is assigned to one of the projectors (315,316,317,318), this — a video projection system given in claim 1 characterized by controlling said intensity modulation means arranged on three partial optical paths by the color video signal (A, B, C, D) from the video source (105,106,107,108) thru/or any 1 term of 10.
[Claim 13] Said light source (400) is a video projection system according to claim 12 characterized by the light source (400) consisting of the three radiation sources (405,406,407) to which each gives one color of red, green, and blue on the optical path which is the radiation source divided into an optical path with separate red, green, and blue color component from now on, or became independent.
[Claim 14] Said light source is a video projection system given in claim 1 characterized by being a RGB laser light source thru/or any 1 term of 13.
[Claim 15] A video projection system given in claim 5 characterized by arranging an expansion element on the lower stream of a river of said division means on each partial optical path of each partial flux of light of primary color thru/or any 1 term of 14.
[Claim 16] It is the video projection system according to claim 11 or 12 characterized by that the three partial flux of lights of the modulated primary color which was related with one projector are guided at a superposition means (75, 76, 77, 78), and compounding the partial flux of light spatially in order to project each color picture, and being projected on said plane of incidence (55, 56, 57, 58).
[Claim 17] Said superposition means for compounding each three images of primary color and forming a color picture is a video projection system given in claim 3 characterized by being arranged after the objective plane inside said element related with one of a projector while forming each image of primary color on said three partial optical paths thru/or any 1 term of 16.

[Claim 18] Said superposition means (75, 76, 77, 78) is set on said three partial optical paths. It is arranged after said three intensity modulation means related with one of a projector. This superposition means (75, 76, 77, 78) is a video projection system according to claim 16 which unifies the three partial flux of lights of primary color to a common optical path (15), and is characterized by arranging said spatial flux of light modulation means next.
[Claim 19] The means (315,316,317,318) for said spatial flux of light modulation is a video projection system given in claim 6 characterized by including the conversion optical element for decreasing or increasing a deflection angle thru/or any 1 term of 18.
[Claim 20] Red, green, and the partial flux of light of blue primary color being generated in order in time on a partial optical path by the light source or the division means and a spatial flux of light modulation means are a video projection system given in claim 1 characterized by being controlled by the signal of the color video source (105,106,107) for time amount duplication actuation thru/or any 1 term of 11, 13, 14, or 19.
[Claim 21] A part of optical path [at least] located between the means for dividing said flux of light and said spatial flux of light modulation means (35, 36, 37) is a video projection system given in claim 1 characterized by being formed of optical fiber connection (45, 46, 47) thru/or any 1 term of 20.
[Claim 22] A part of optical path [at least] located between said intensity modulation means (25, 26, 27) and said spatial flux of light modulation means (35, 36, 37) is the video projection system according to claim 6 characterized by being formed of optical fiber connection (45, 46, 47).
[Claim 23] A part of optical path [at least] located between said superposition means (75, 76, 77, 78) and said spatial flux of light modulation means (35, 36, 37, 38) is the video projection system according to claim 18 characterized by being formed of optical fiber connection (45, 46, 47).
[Claim 24] the flux of light (1) which has the two or more polarization directions be alike the light source (600) — a video projection system given in any 1 term of claims 1, 11, or 12 characterized by ******(ing) and said division means forming the partial flux of light (2 3) which has the polarization direction which is different while each has a partial optical path.
[Claim 25] Two or more flux of lights with the difference of wavelength smaller than 80nm being generated according to the light source and said division means are a video projection system given in any 1 term of claims 1, 11, or 12 characterized by generating the partial flux of light in which each has a partial optical path while having different wavelength.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the video projection system for projecting two or more images on a detail more about a video projection system.
[0002]
[Description of the Prior Art] In such a projection system, the light source for generating at least one flux of light, the intensity modulation means and spatial flux of light modulation means controlled by the video signal, and at least one plane of incidence for displaying each image of a predetermined number are arranged in accordance with an optical path.
[0003] The projector (projector) equipped with the light source based on the following two principles of operation is known. Namely, 1. Projectors based on the conventional imaging principle, such as a LCD projector and a DLP projector. These projectors are called a "image-imaging projector" below. 2. Projector using the flux of light deflected by two-dimensional. These projectors are called a "laser display" or a "laser projector."
[0004] The above-mentioned projector can be designed for the purpose of projecting a monochrome image and monochrome image chiefly. It is enough to change electronic image information into a luminous-intensity modulation or intensity modulation in such a case. It depends for the impression of an image on adjustment of the brightness of the image to the situation of a surrounding light the 1st. The maximum brightness of an image is restricted by the optical output modulated 100%. The impression of an image is further determined by the level of contrast. Modulation width of face is fixed in adjustment of contrast. That is, the gray value of a video signal is correlated with the optical output modulated by corresponding.
[0005] What is necessary is to receive mutually and just to adjust the parameter of the brightness of a projector, contrast, and spectral intensity distribution, when projecting the image with the same projector of two or more same classes arranged by adjoining each other mutually. Therefore, possible adjustment of 12 may exist in four projectors to four images.
[0006] Furthermore, the image modulation means and the related electronics control section of a projector need to operate in the completely same property. Only by this, it becomes actually possible to project the image with two or more same projectors which receive the same video information.
[0007]
[Problem(s) to be Solved by the Invention] The degree of freedom at the time of adjusting a projector increases large about 3 times, when generating a color image. In the case of a color picture projector, this is explained by when three monochrome systems of a different color, i.e., the system for primary color red (R), and system ** the system of ** and for primary color green (G) primary color blue (B) are together. Therefore, nine possibility can be considered when adjusting the color effectiveness of an image, contrast, and brightness. Therefore, the degree of freedom of adjustment with four projectors is already set also to 36. The property of the image of the following in relation to people's check-by-looking capacity must be almost the same in two or more projectors. That is, they are ****** of contrast (light-and-darkness ratio), gradation (channel gradation), a convergence (overlap of a color), and an image, the presentation (pixel

structure) of an image, brightness (luminous intensity), color reinforcement (saturation), and a color tone (hue). Especially the color difference between the projectors which project an image so that each other may be adjoined directly mutually (difference of colour stimulus specification) is detected by people by very high sensibility. The purpose which carries out the maximum coincidence of the projection property of two or more projectors is actually attained only by spending a considerable technique, cost, an effort, and time amount.
[0008] In order to project a big image, the whole image is usually formed combining two or more separate images. Each image is formed by one projector, respectively for this purpose.
[0009] The configuration equipped with two or more LCD projectors as an example is known. the [Europe patent application public presentation official report] — according to EP 0731603ANo. 2, such a projector has the source of the white light where red, green, and the blue three primary colors are taken out, respectively. The configuration equipped with the three light sources which each gives one primary color is also known. These light sources are temperature radiators. There is a big problem in the solution using a temperature radiator. The watcher of a projection image expects brightness and an image with a uniform color expression. However, this is not realized when the projector which forms each image has each light source. Each brightness and color reproduction property of the light source of each projector become the same, and it is hard to think that it is maintained still more nearly everlastingly with the same condition.
[0010] The greatest trouble is that the degrees of aging of a projection lamp differ and change which cannot be predicted occurs in spectral intensity distribution through this process. Even if it is the same class and use age, it is shown by the experiment that the color temperatures of each projection lamp differ sharply in a radiation property. Consequently, the color which changes in each image with each projectors is reproduced. The methods of change of the color temperature of the projection lamp of each [the process of aging] differ greatly.
[0011] Another cause of the difference of spectral intensity distribution is each difference and tolerance in the electric power supply to the light source or a cathode-ray tube of a projector. All of these effects are connected with the futility of time amount and an ingredient when an operator adjusts and maintains the brightness of each projector of this kind of equipment, and the balance of the color effectiveness. The image which consists of each image must actually fulfill the suitable conditions about quality. The process which makes each image in agreement is a complicated thing which time amount requires very much. When increasing brightness by changing the supply voltage or the supply current to a projection lamp as an example, a color temperature also changes. This effect can be compensated only by the new color-matching approach of a projector. When a projection lamp breaks down and it is exchanged for a new thing, since new projection lamps differ greatly in an optical output and a color temperature as compared with what is already used over the long period of time, this process will become still more uneconomical. Therefore, when one projection lamp breaks down, all the projection lamps of a system must often be exchanged. This also leads to increase of cost.
[0012] the [furthermore, / Europe patent application public presentation official report] — according to EP No. 0589179, it is possible to transpose the projection lamp (temperature radiator) of an image imaging projector to a laser light source. A laser light source has the advantage that it is possible to emit the light of predetermined wavelength as compared with a temperature radiator. That is, the laser light source from which the same class differs can emit the light of the completely same wavelength. This gives the big advantage that spectral intensity distribution is the same, in the laser light source which has the same structure.
[0013] However, when a monochrome system is used also in this case, a difficulty arises, and when operating two or more laser light sources which receive each two or more images so that the whole image may give an impression with uniform brightness, big technical cost is required.
[0014] The image imaging laser projection system which forms a color picture also needs red, green, and three laser light sources of blue primary color to each projector. as this example — the [Europe patent application public presentation official report] — there is a DLP system based on EP 0589179ANo. 1. In this system, three laser light sources generate the laser beam bundle from which wavelength differs. This flux of light is spatially compounded by the optical element, and is expanded even to the magnitude of a DMD array. A DMD array carries out image

formation on a plane of incidence with a projection objective lens.
[0015] The strong ratio which receives mutually [three laser light sources of a projector], the maximum reinforcement (brightness of an image) of each projector, and modulation width of face (contrast) must be mutually made completely in agreement in the multiple configuration of these projectors. About this, in order to obtain homogeneity and a strong uniform exposure over the whole surface of the objective plane inside each projector, a special problem arises by expanding each laser beam bundle even to the magnitude of a DMD array.
[0016] In this case, although it is thought that adjustment becomes easy with the fixed wavelength of a laser light source, in order to balance the RGB laser light source of two or more projectors so that it may have the reappearance property that all images are almost the same, to a color picture, an effort great also in this case is needed.
[0017] Furthermore, the projector using the write-in flux of light is known (the [an example / United States patent] USPS No. 5,424,771). Since an image is formed in the Rhine dimension of a laser beam bundle parallel as a matter of fact, the main advantages of such a laser projector at the time of comparing with an image imaging projector are that optical IMEJINGU of the object from an objective plane to an image plane is not performed. However, about the problem which adjusts the same reappearance property in two or more projectors, some improvement is only found as compared with the configuration mentioned above. The projector with which the main advantages about this point operate using the write-in flux of light is a point which does not have an objective plane inside equipment and the problem of a uniform exposure of an objective plane does not produce. It has the further advantage that the focal depth of this kind of projector is infinite as a matter of fact, and an always clear image is obtained.
[0018] However, when two or more projectors are used, in spite of being controlled by the same video signal, it is shown by the experiment that the difference which is visible to an eye in a reappearance image arises, and a degree of freedom is able to reduce this in the adjustment for every projector only with the means of 9 which starts comparatively as for a hand.
[0019] The difficulty in making a projection property in agreement in two or more projectors is mainly based on the difference between the beam-of-light parameters of the laser beam bundle of two or more same laser light sources. Fundamentally, these parameters are the diameter of the flux of light, emission, a polarization condition, and mode structure. Also in this case, when maintaining the condition that two or more images look the same, the further effort is needed for sufficient extent making these parameters in agreement about a different laser light source. There is a point that the stability of each laser light source of operation must be maintained over a long time as another trouble.
[0020] In the simulator of a truck, a HEL, the aircraft, or a vessel, in order to simulate a horizontal image include angle so that it may actually be visible in an actual situation, an image is projected in a cylinder or a spherical side. The image in this case is constituted by two or more images from a different projection device for the big viewing angle needed in order to acquire the impression of an actual image.
[0021] The configuration for projecting an image on U.S. Pat. No. 4,297,723 in an above-mentioned way using a projector is indicated. Intensity modulation of red, green, and the three blue laser beam bundles is separately carried out to a left-hand side image, a right-hand side image, and a central image. The light of the red of each image by which intensity modulation was carried out, green, and blue is spatially compounded by the color mirror. The three parallel flux of lights in which each contains the image information of each image are formed. Both these flux of lights are deflected by two-dimensional by the biaxial scan system. Next, the three flux of lights are deflected towards the plane of incidence which curved with the incident light study element specially constituted so that three images might form the whole image. A central image is projected in the direction given by the scan system. A right-hand side image and a left-hand side image are spatially separated from a central image by the deviation mirror. In order to be constituted so that a joint may be lost to extent which can permit the whole image, these mirrors must be correctly adjusted to the shaft of the main incident light line. Angle of projection must not far exceed 50 degrees for the deviation mirror needed in order to divide an image.
[0022] Since it is technical, when it is many for which only one projection device is used, it is

difficult to perform image projection about the level viewing angle of 200 degrees. Two pieces (example: the [Europe patent] EP 0210088BNo. 1) on which each projects the image according to individual, three pieces, four pieces, and more projection channels (example: the [Europe patent application public presentation official report] EP 0522204ANo. 1, U.S. Pat. No. 5,424,771) than this are used, each image is joined, and the whole image is sometimes formed. With the conventional technique, a number of the projectors and the light sources needed by the projection channel are used for this purpose. A projector is constituted so that it may ask by image projection and an image may be arranged together.
[0023] the [Europe patent application public presentation official report] -- if based on EP 0522204ANo. 1, six projectors will be arranged in the center of a projection dome. In this case, according to drawing 31, six pieces or the RGB laser light source beyond it which operates independently is used, and a RGB laser light source has the laser light source of primary color which operates independently, respectively. Two or more projectors which have the power source and control section of laser which each became independent of are used.
[0024] If it is based on the phase of development at present so that it may guess from the above explanation, in order to perform projection covering the whole surface of a very big image, especially a dome, it is required to use two or more projection devices. However, especially with this kind of equipment, cost benefits large superfluously the installation of a projection system and maintenance which have the independent light source.
[0025] Therefore, each of this invention is the same about the property of brightness, contrast, and color reproduction, and it solves the problem which gives the video projection system for projecting two or more images with which each is similarly maintained about these properties at the time of actuation.
[0026]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is a video projection system for projecting two or more images, and offers the video projection system by which the light source which generates at least one flux of light, the intensity modulation means and spatial flux of light modulation means controlled by the video signal, and at least one plane of incidence for displaying each image of a predetermined number are arranged in accordance with an optical path. If based on this invention, a video projection system is the projector of the predetermined number corresponding to the number of each images, it will have the projector with which each has a means for a spatial flux of light modulation, and these means will be optically connected to the light source. Furthermore, the means for dividing the flux of light into the partial flux of light of the predetermined number corresponding to the number of projectors is arranged after the light source in accordance with an optical path. Each of the partial flux of light has a partial optical path, the means for intensity modulation is arranged following each partial optical path, and the means for intensity modulation and the means for a spatial flux of light modulation are controlled by the signal of the video source while they are arranged along with one of the partial optical paths.
[0027] One of the advantages of this invention is a point which receives light from the one main light source, although two or more projectors are separated about spatial arrangement, the projection direction, or the plane of incidence. According to the class of projection device, at least one video signal for two or more projectors is generated, and the means for the means for intensity modulation or a space flux of light modulation is supplied. The number of these means is equivalent to the number of projectors.
[0028] The one video source does not mean that the one source is used for image generation, and means that it is possible to use the video source with which the predetermined numbers corresponding to the number of projectors differ. That is, it is possible to relate the one video source with each projector. The source can use a television oscillator and a videocassette recorder as an example.
[0029] Furthermore, it is possible to divide the video information on a whole image into the video information unit of a predetermined number to each image corresponding to the number of projectors, and each projector is controlled by this video information, respectively. In this case, a projector can be arranged with sense by which a whole image is constituted from each image.

The reappearance property of a projector over the image of each [here] becomes almost the same. The difference in the brightness by the light source, contrast, or a color is lost.
[0030] Some fundamental possibility can be considered about the projection system use based on this invention. Namely, 1. Each of a projector can project the same image or a different image, a projector is arranged in this case in a different location, and each projector projects each image on a corresponding plane of incidence. Especially since the one light source is only needed when projected on the location where two or more images which may have different contents of an image differ, this configuration is economical. Therefore, especially the cost for obtaining a required optical output is sharply reduced, when a laser light source is used. 2. Each of a projector can still form each image which forms some big whole images. A big whole image is constituted by each image on each plane of incidence when the projector is arranged with the suitable sense to the plane of incidence. The main advantage in this case is a point that each image is formed by brightness, contrast, and the projector with the same property of the color effectiveness. 3. Arrange on the plane of incidence of each [the sense which can pile up each image which is different on one plane of incidence in each of a projector]. Therefore, it is possible to form a color picture as an example with three monochrome projectors which give the image of primary color. Moreover, it is possible to form a stereoscopic vision image using an ellipsometric method or the color method.
[0031] The means for dividing the flux of light can be constituted combining a half mirror, a color mirror, a splitter cube, a diffraction grating, or a polarizer. These means must have the property divided into the different partial flux of light divided based on reinforcement, a phase location, the polarization direction, or wavelength while following an optical path which is different in the flux of light from the light source. Although some of these means are explained more to a detail in an example, if it is this contractor, other configurations and combination for dividing the flux of light which realize the smallest configuration very economically will be obvious. Generally, it is possible to acquire the optical path which does not take a spatial location while treatment is easy using the further polarization mirror.
[0032] The means for dividing the flux of light functions, when dividing the flux of light from the light source into a predetermined ratio to an intensity modulation means. In order to project an image in the same property, the split ratio to all the partial flux of lights is chosen so that it may become the same as the number of projectors. When forming the image with which brightness differs from a color impression, it is also possible to define different split ratio.
[0033] Division is determined that it will not change in time by the half mirror or the color mirror as an example. It is possible to make adjustment and modification of split ratio with the control unit and adjustment means for dividing the flux of lights, such as the laser optic company (Laseroptik GmbH, Garbsen) make D-30826, as an example, while projecting an image. However, once split ratio is set up, adjustment brightness and an adjustment color impression will become lasting.
[0034] The means for intensity modulation is the same as the means for a space flux of light modulation in the image imaging projector stated to the above-mentioned item 1. These means form the internal objective plane of all projectors, and form each image. These means are realized by a LCD matrix, a DMD array, or other light sources that emit light passively.
[0035] In itself, all the means that affect the intensity distribution of the expansion flux of light in the cross section as the image source which does not emit light are included. As an example, although the slide of a positive, a diaphragm or a shutter, a light valve, etc. are contained, the matrix which generates light actively [diode, a transistor a miniature electron tube, etc.] is not included.
[0036] Each image can be directly seen in a LCD matrix as an example. However, in order to obtain a big image, each image formed in the internal objective plane of a projector is expanded on a plane of incidence with a projection objective lens.
[0037] It is a chisel that the expansion element of the predetermined number corresponding to the number of projectors is arranged following the division means of a partial optical path to each partial flux of light, when the path of the partial flux of light is [and] smaller than the magnitude of the objective plane inside equipment in an image imaging projector, and each

expansion element expands the partial flux of light even to the magnitude of the internal objective plane of each projector. Expansion of the partial flux of light to the magnitude of a corresponding internal objective plane enables it to irradiate an internal objective plane according to other partial flux of lights in other projectors, and the partial flux of light which has the same property.
[0038] In the laser projector stated to the above-mentioned item 2, a space flux of light modulation means contains the biaxial actuation deviation system which deflects the corresponding partial flux of light to two-dimensional. The line recognized by the watcher as a frame or an image on a plane of incidence according to this written-in partial flux of light is formed as a close train.
[0039] A biaxial deviation system is combination with the tilt mirror for the polygon mirror for the Rhine deviation, an image, or frame scanning at a detail. A biaxial deviation system can realize an above-mentioned means advantageously by arranging to a duplex. however, a biaxial actuation deviation system — the [international patent application public presentation official report] — it is also possible to constitute from a controllable means expressed to WO 96/No. 25009. In this case, it is important for the flux of light to become irregular only in that radiation direction.
[0040] In the projector which operates in the write-in flux of light, the means for intensity modulation is an electro-optics acoustooptics-modulator [a detail]. These modulators produce the partial flux of light in which intensity modulation was carried out by comparatively easy electric control.
[0041] furthermore, a luminous-intensity modulation or amplitude modulation — the [international patent application public presentation official report] — it is also possible to carry out based on one of the principles expressed to WO 96/No. 25009. Two kinds of light sources are used in this invention.
[0042] The light source of the 1st class is the radiation source which has the optical intensity-distribution curve expanded spatially. These radiation sources are realized as luminous-radiation objects, such as temperature radiators, such as a halogen lamp, or light emitting diode.
[0043] The light source of the 2nd class is the radiation source which produces the flux of light parallel as a matter of fact. If based on a current technique, this radiation source will be a laser light source. In a video projection system, especially a suitable laser light source has the property that emission of the flux of light is restricted by diffraction.
[0044] The video projection system based on this invention is suitable especially also when projecting a color picture. As for this kind of video projection system, the optical path of the flux of light containing the primary color of red, green, and blue is characterized [1st] by following the light source. A division means is arranged on this optical path, divides the flux of light into the partial flux of light of the predetermined number corresponding to the number of projectors, and divides each of these partial flux of lights into the three more partial flux of lights. Each of the partial flux of light has a partial optical path while containing red, green, and one color in blue primary color, and an intensity modulation means is arranged on each partial optical path. Furthermore, each of three partial optical paths to which it is shown to one of the partial flux of lights which are red, green, and one color of blue primary color is assigned to one of the projectors, and the intensity modulation means placed on these three partial optical paths is controlled by the color video signal from the video source.
[0045] The video projection system for projecting a color picture is characterized [2nd] by arranging the means for dividing the three flux of lights on these three optical paths while red, green, and the optical path over the flux of light of blue primary color separated spatially follow the light source. These means divide each of the three flux of lights into the partial flux of light of the predetermined number corresponding to the number of projectors. Each partial flux of light has a partial optical path, and an intensity modulation means is arranged on each partial optical path here. Furthermore, each of three partial optical paths to which it is shown to one of the partial flux of lights which are red, green, and one color in blue primary color is assigned to one of the projectors, and the intensity modulation means placed on these three partial optical paths is controlled by the color video signal from the video source.
[0046] In the case of the latter, the light source is the radiation source divided into an optical

path with separate red, green, and blue color component from now on, or the light source consists of the three radiation sources from which each produces one of red, green, and blue in the independent optical path.
[0047] In order to acquire homogeneity and a permanent image reconstruction property as much as possible, in the range of this invention, especially use of the light source which is a RGB laser light source is advantageous. although a temperature radiator gives a continuous spectrum, a spectral region in three primary colors is taken out from this continuous spectrum — being sufficient . The big energy loss by heat is always mainly followed on actuation of a temperature radiator. However, a RGB laser light source gives only three Mitsunari of a several nanometers wavelength field. The wavelength of this laser beam can be maintained time almost uniformly based on the property of the laser matter.
[0048] The rate of an output to each in three primary colors can be adjusted very stably with an electronic control. as an example, the white balance of the light source of a projector to the standard intensity of illumination D65 equivalent to day ranges is [100% (632nm) of red] green – – the power ratio of 67.9% (445nm) of blue is needed 95.3% (532nm).
[0049] That an expansion element is arranged following a division means on the partial optical path of each partial flux of light of primary color One of the partial flux of lights of primary color is expanded even to the magnitude of the internal objective plane of the projector with which it is a chisel when the path of the partial flux of light is smaller than the magnitude of the objective plane inside equipment, and each expansion element corresponds in the image imaging projector stated to the above–mentioned item 1.
[0050] In the above–mentioned two modifications of the video projection system for projecting a color picture, an advantageous configuration is the point of being projected on the partial flux of light compounded spatially for the three partial flux of lights related with the projector and each color picture being assigned to a superposition means, and projecting each color picture on a plane of incidence.
[0051] Here, it does not mean that the partial flux of light piles up "superposition" of the partial flux of light on a plane of incidence on a direct plane of incidence, and the partial flux of light means that it is possible to pile up in the field between an intensity modulation means and a plane of incidence. The point that a synthetic color picture is formed on a plane of incidence from the partial flux of light of a different color regardless of the location of superposition as a result of this superposition is important. The partial flux of light of the color from which it differs on three partial optical paths is piled up by the following three approaches, and forms each color picture. That is, the partial flux of light of three different colors of primary color is directly piled up on this plane of incidence about each image with a color picture projector equipped with three projection channels for the image reconstruction by which 1 itself was turned to the plane of incidence of each image. 2) Pile up the image of three different colors of primary color about the image of each [the optical–path top between a spatial flux of light modulation means and a plane of incidence]. 3) Pile up the partial flux of light of three different colors of primary color about the image of each [the optical–path top between an intensity modulation means and a spatial flux of light modulation means].
[0052] Furthermore, the number of color components is not limited to the three primary colors. Since all other colour stimulus specification in the chromaticity diagram made by the three primary colors by using the three primary colors is obtained, this configuration is only one of the especially advantageous things. This invention can be realized using two colors other than the three primary colors, or three colors. In this case, when the image of high quality is not formed or more colors than three colors are used, cost increases.
[0053] It has set that it is arranged in three partial optical paths after the objective plane inside the equipment related with one of the projectors to each color picture while the means for piling up three images of primary color and forming each color picture forms each image of primary color to the image imaging projector stated to the above–mentioned item 1, and it is a chisel.
[0054] On the other hand, in the laser projector stated to the above–mentioned item 2, especially the point arranged after three intensity modulation means by which the superposition means was associated on three partial optical paths by one of the projectors is advantageous. A

superposition means compounds the three partial flux of lights of primary color to a common optical path, and a space flux of light modulation means is arranged next.
[0055] In this case, since spatial integration is performed in this side of a spatial flux of light modulation means and the problem of a convergence does not arise on a plane of incidence, a problem is not produced when piling up the three flux of lights of primary color. However, it is also possible to carry out by piling up the image of a color which is different in a laser projector on a plane of incidence or after a spatial flux of light modulation means in one of the superposition of the flux of light of the color from which a **** differs.
[0056] In the laser projector described in the above-mentioned item 2, in order to adjust image size, as for a spatial flux of light modulation means, it is desirable to include the conversion optical element which decreases or increases a deflection angle.
[0057] Furthermore, a video projection device can have the light source which generates red, green, and the partial flux of light of blue primary color in order in time. It is also possible to perform time continuous generating of this partial flux of light with a division means. A time amount duplication mode of operation for this to project each color picture is obtained, and an intensity modulation means and a spatial modulation means are controlled based on a video signal. These video signals are generated corresponding to time amount duplication actuation. Since this kind of image formation has the small cost concerning adjustment of each color channel in such a case, it is advantageous especially in an image imaging projector. furthermore, this time amount duplication mode of operation — a component — about — it has the general advantage that reducing by 2/3 is possible.
[0058] or [whether in many applications, the light source is detached and arranged from a projector, or spatially, projectors are detached a little and they are installed, or / that it is required to carry out and to arrange flexibly spatially] — or it is recommended. For this reason, optical fiber connection is prepared in the part between the flux of light division means on each partial optical path, and a spatial flux of light modulation means. It is important for each partial flux of light to be combined with one or more optical fibers as completely as possible.
[0059] In the laser projector using a write-in laser beam bundle, optical fiber connection is especially prepared preferably between the intensity modulation means on a partial optical path, and a spatial flux of light modulation means. Moreover, optical fiber connection can also be prepared between a division means and an intensity modulation means.
[0060] A part of partial optical path [at least] located between a superposition means and a spatial flux of light modulation means in the video projection system which forms a color picture based on the laser projector stated to the above-mentioned item 2 has especially the advantageous thing formed of optical fiber connection.
[0061] However, no partial optical paths are necessarily required for having optical fiber connection. It is also possible to combine optical fiber connection with other optical transmission lines. Furthermore, in order to acquire a three-dimension image impression, it is also possible to use this invention advantageously in the video projection system which two images pile up. projecting each image with which the 1 polarization directions differ as an approach suitable when the laser light source is used especially (a laser light source giving the light which polarized generally), and 2 — although it has slightly different wavelength, there are two of projecting each image perceived as the same color (a laser light source generating light with small bandwidth generally) in people's eye.
[0062] the 1st approach — as an example — the [German patent] — although indicated by DE19537356C No. 1, the image with which the polarization direction formed by the projector here intersected perpendicularly mutually piles up. Also in this case, the one light source is used and it is advantageous on a plane of incidence coincidence and that two images are formed mutually-independent.
[0063] Here, the light source generates the light which has at least two different polarization directions, and each polarization is guided at an intensity modulation means. In this case, it is possible to control an intensity modulation means by the source on top of which an image is laid so that the 3rd Motomi may be made possible. The modulated flux of light is projected on a plane of incidence by each projector adjusted by receiving mutually.

[0064] However, it is possible to acquire the different polarization direction also by using the light source which gives the flux of light which carried out the circular polarization of light. In this case, the two different polarization directions are acquired by the flux of light division means.
[0065] the [German patent] — generating and division of polarization different here are performed before an intensity modulation means to the indication of DE19537356C No. 1. This divides and has the advantage that the image according to individual is generated by coincidence to a right eye and a left eye. here, in order to obtain the resolution of an image which is realized in two-dimensional projection, each image is alike, respectively, it receives, and one projector is used.
[0066] the 2nd approach — as an example — the [German patent application public presentation official report] — although indicated by DE 19808264ANo. 1, the image which has a different frenum region wavelength field formed by the projector piles up here.
[0067] If based on this invention, the light source can generate the flux of light of different wavelength to which the difference of two different wavelength becomes smaller than 80nm. The two partial flux of lights arise with a flux of light division means, and it shows around at the intensity modulation means which can be controlled by the source on top of which an image is laid so that "the 3rd Motomi" may be made possible. The modulated flux of light is projected on a plane of incidence by each projector adjusted by receiving mutually.
[0068] The flux of light of the light source is divided into the partial flux of light in all cases by the configuration based on this invention. It is possible to reduce cost sharply according to this process as compared with a well-known configuration.
[0069] Electronic video information is changed into optical video information by the intensity modulation means or the spatial flux of light modulation means, and an image is formed from two or more projectors spatially arranged independently using this information. A very big advantage is acquired by using a laser light source, when generating the RGB flux of light. It is possible to maintain at stability the wavelength to which the laser light source was set beforehand over the whole life of a lamp. It is possible to make the color reproducing characteristics of a projector by this eternally the same between projectors in time. All the optical elements used, such as a deviation mirror, a half mirror, and a color mirror, are passive elements optically, it is not dependent on an output and the function does not change along with the passage of time.
[0070] The video projection system using two or more projectors can be constituted more simply. It is also possible to reduce sharply the cost accompanying such a video projection system use and maintenance by the system based on this invention.
[0071]
[Embodiment of the Invention] This invention is explained below at a detail based on drawing 1 thru/or drawing 7 . Drawing 1 shows the video projection system for projecting three images, and Images A, B, and C are formed of the write-in flux of light. optics — a signal — conveying — a part — the flux of light — two — ' — three — ' — four — ' — intensity modulation — carrying out — things — being possible — double — the light source — 101 — three — a piece — a projector — 115,116 — and — 117 — between — an optical fiber — connection — 45 — 46 — and — 47 — transmitting — having . Three projectors 115,116 and 117 are turned to planes of incidence 55, 56, and 57, respectively.
[0072] Furthermore, the double light source 101 which can carry out intensity modulation, projectors 115,116 and 117, the electronic control unit 105 for the video channels C corresponding to each, the electronic control unit 106 for video channel B, and the electronic control unit 107 for video channel A are connected electrically.
[0073] In this operation gestalt, three images can be projected mutually-independent about a direction, a location, size, and the contents of an image. It receives mutually and the installation location of the planes of incidence 55, 56, and 57 assigned to projectors 115,116 and 117 and each projector can be chosen comparatively independently. It is easily possible to take the distance of 60 meters among three projectors 115,116 and 117. The maximum distance from the double light source 101 which can carry out intensity modulation to projectors 115,116 and 117 must not far exceed 30 meters for the optical attenuation of an optical fiber available at present which leads to loss on the strength.

[0074] The double light source 101 in which the thing which was shown in the example based on drawing 1 , and which carry out intensity modulation is possible consists of a means 111 for dividing the light source 100 and the flux of light 1 into the three partial flux of lights, and three intensity modulation means 25, 26, and 27. The flux of light 1 injected from the light source 100 is divided by the means 111 for dividing the flux of light into the three partial flux of lights 2, 3, and 4 of the same reinforcement. Therefore, each of the partial flux of lights 2, 3, and 4 has one third of the reinforcement of the flux of light 1. The partial flux of lights 2, 3, and 4 form each images A, B, and C on planes of incidence 55 and 56 and 57.
[0075] In this example, the light source 100 is a monochrome laser light source with a wavelength of 532nm. In this example, a means 111 to divide the flux of light 1 into the three partial flux of lights consists of a 33% splitter mirror 61 which is a half mirror, and a 50% splitter mirror 62. It is arranged forward and backward mutually [the splitter mirror 61 and the splitter mirror 62] on the optical path of the flux of light 1. In this case, 90 degrees of partial flux of lights 2 and 3 are deflected by the deviation mirror 65. The means 25, 26, and 27 for intensity modulation are related with each of the partial flux of lights 2, 3, and 4, respectively. In this example, an intensity modulation means is an acoustooptic modulator. Each of three intensity modulation means 25, 26, and 27 which operates mutually-independent receives an electrical signal from one of electronic control units 105,106 and 107. These electrical signals support the image information of each image displayed on planes of incidence 55 and 56 and 57. The electrical signal for intensity modulation is acquired from video signals A, B, and C.
[0076] as an example -- the [German patent] -- the approach of a video data and the method of controlling a modulator are stated to DE19537356C No. 1. If it thinks in the travelling direction of light, the edge of the optical input side of the optical fiber connection 45, 46, and 47 will be arranged after the intensity modulation means 25, 26, and 27 on an optical path. Modulated partial flux of light 2', 3', and 4' are inputted into the edge of an optical input side, respectively. In this example, each optical fiber connection 45, 46, and 47 consists of coupling-out optical elements of the optical output edge of the coupling-Inn optical element of an optical input edge, a multiplex-mode optical fiber, and an optical fiber. as an example -- the [German patent application public presentation official report] -- it is related and stated to DE 19616843ANo. 1 how optical fiber connection of this kind is constituted in a video projection system.
[0077] Each optical output edge of the optical fiber connection 45, 46, and 47 is connected to one of the projectors 115,116 and 117. In this example, projectors 115,116 and 117 are equipped with the means 35, 36, and 37 for a spatial flux of light modulation, respectively. Incidence of the partial flux of light which comes out of the optical fiber connection 45, 46, and 47 is carried out to the spatial flux of light modulation means 35, 36, and 37, respectively. The spatial flux of light modulation means in this example consists of tilt mirrors for the rotating type polygon mirror for the Rhine deviation, and a frame deviation. this kind of configuration -- the [German patent] -- although stated to DE4324849C No. 2, the conversion optical element for increasing the deflection angle of the flux of light is arranged after two deviation mirrors. When a conversion optical element is needed, it is also possible to constitute a part of each spatial flux of light modulation means from a conversion optical element. The partial flux of lights 15, 16, and 17 deflected in the direction of Rhine and the direction of a frame are alike, respectively, and each images A, B, and C are formed.
[0078] Drawing 2 shows the video projection system for projecting three images formed of a LCD matrix, and A, B and C. The projector which operates using a LCD matrix is contained under the category of an image imaging projector. Also in this example, a laser light source is used as the light source 200, and the optical fiber connection 45, 46, and 47 is used in the optical channel. In this case, the video projection system which can be set contains the double light source 201 (intensity modulation cannot be carried out) and three projectors 215,216 and 217 which generate the three partial flux of lights 2, 3, and 4. Each projector is turned to one of planes of incidence 55, 56, and 57. The optical connection between the double light source 201 and projectors 215,216 and 217 is obtained by three optical fiber connection 45, 46, and 47. It is possible to project three images mutually-independent about a direction, a location, size, and the contents of an image by this configuration.

[0079] It receives mutually and the installation location of the planes of incidence 55, 56, and 57 assigned to projectors 215,216 and 217 and each projector here can be chosen comparatively independently, as stated with reference to drawing 1 .
[0080] In the example based on drawing 2 , the double light source 201 has the means 211 for dividing the one light source 200 and flux of light into the three partial flux of lights. The flux of light 1 which comes out of the light source 200 is divided into the three partial flux of lights 2, 3, and 4 with equal reinforcement by the division means. That is, each of the partial flux of lights 2, 3, and 4 has one third of the reinforcement of the flux of light 1. In this example, the light source 200 is a laser light source with a wavelength of 532nm. The means for dividing the flux of light 1 contains the splitter mirror 61 and 50% splitter mirror 62 33%. It is arranged forward and backward mutually [the splitter mirror 61 and the splitter mirror 62] on the optical path of the flux of light 1. In this case, incidence of the partial flux of lights 2, 3, and 4 is carried out to one of the optical input edges of optical fiber connection by the deviation mirror 65 and the coupling-Inn optical element.
[0081] In this example, each optical output edge of the optical fiber connection 45, 46, and 47 is connected to one of the projectors 215,216 and 217. In this case, each projectors 215,216 and 217 have the optical elements 225,226 and 227, the intensity modulation means 25, 26, and 27, the spatial flux of light modulation means 35, 36, and 37, and the incident light study elements 85, 86, and 87 for expanding the partial flux of lights 2, 3, and 4. In this case, the partial flux of lights 15, 16, and 17 always contain the full-sized image information of each image.
[0082] In this example, the intensity modulation means 25, 26, and 27 are the same things which were in agreement with spatial flux of light modulation means 35, 36, and 37 to correspond. These means are realized by the LCD matrix in this example. Each LCD matrix is arranged before the focus by the side of the target of the incident light study elements 85, 86, and 87. A LCD matrix is an objective plane inside equipment, and it is controlled by the electronics control section 105 so that the whole image is projected in the objective plane on which it is projected on planes of incidence 55 and 56 and 57 with the incident light study elements 85, 86, and 87. One electronic control unit 105 which processes video signal A in this example is formed. Therefore, it is projected on the same image by planes of incidence 55, 56, and 57. Each image is projected on different space as an example.
[0083] The optical elements 225,226 and 227 for expanding the partial flux of light are needed when the image field of a LCD matrix expands homogeneity and the partial flux of light injected from an optical fiber until it irradiates completely as much as possible. the image imaging projection system using the expanded laser beam bundle — as an example — the [Europe patent application public presentation official report] — it is indicated by EP No. 0589179. In this case, a DMD array is used as an intensity modulation means and a spatial flux of light modulation means.
[0084] Drawing 3 shows the optical configuration of the video projection system for projecting four color pictures A, B, C, and D equipped with the double light source 301 in which intensity modulation is possible.
[0085] The light source 300 generates the red-green-blue light bundle 1 (RGB flux of light). In this example, the flux of light is a RGB laser beam bundle. Incidence of the flux of light 1 is carried out to the 1st half mirror 62. The 1st half mirror 62 divides the flux of light 1 into the two partial flux of lights 2 and 3 which have 50% of reinforcement of the incidence RGB flux of light 1, respectively. The 2nd half mirror 62 which forms the partial flux of lights 4 and 6 which have 25% of RGB reinforcement of the RGB flux of light 1, respectively is arranged on the optical path of the partial flux of light 2. Hereafter, an optical path is explained only about the optical element for the image display in the video channel D. 90 degrees of partial flux of lights 3 are deflected by the deviation mirror 65 50%. Then, incidence of the partial flux of light 3 is carried out to the further half mirror 62. The partial flux of lights 5 and 7 in which each has 25% of reinforcement of the RGB flux of light 1 are formed. Incidence of the partial flux of light 7 is carried out to the 1st color mirror 63 25%. As for the 1st color mirror 63, it reflects and the red partial flux of light 8 of the partial flux of light 7 penetrates green and the blue partial flux of light 9. Incidence of green and the blue partial flux of light 9 is carried out to the 2nd color mirror 64. As for the 2nd color

mirror 64, it reflects and the green partial flux of light 10 penetrates the blue partial flux of light 11 towards the intensity modulation means 25. The green partial flux of light 10 and the red partial flux of light 8 are deflected towards the intensity modulation means 25 by the further deviation mirror 65 on an optical path. In this example, the intensity modulation means 25 has three independent modulators on the strength corresponding to each primary color in each.
[0086] Division of the flux of light of the video channel D described here is the same also about the video channels A, B, and C. The half mirror 62 which functions when dividing the flux of light 1, the deviation mirror 65, and the color mirrors 63 and 64 constitute the means 311 for dividing the RGB flux of light 1 into the four partial flux of lights.
[0087] The red partial flux of light 8, the green partial flux of light 10, and the blue partial flux of light 11 carry out incidence to the intensity modulation means 25R, 25G, and 25B, respectively, with a red modulating signal, intensity modulation means 25G are controlled by the green modulating signal, and intensity modulation means 25R can control intensity modulation means 25B by the blue modulating signal.
[0088] The intensity modulation means in the video channels A, B, and C is constituted similarly. The superposition means 65 is arranged after the intensity modulation means 25 on three partial optical paths of primary color. The deviation mirror 65 is arranged on the partial optical path of red partial flux of light 8' by which intensity modulation was carried out. a part — an optical path — a top — a deviation — a mirror — 65 — after — **** — a color — a mirror — 64 — placing — having — intensity modulation — carrying out — having had — red — a part — the flux of light — eight — ' — penetrating — although — intensity modulation — carrying out — having had — green — a part — the flux of light — ten — ' — reflecting . intensity modulation — carrying out — having had — red — and — green — a part — the flux of light — nine — ' — a part — an optical path — a top — placing — having had — a color — a mirror — 63 — intensity modulation — carrying out — having had — red — and — green — a part — the flux of light — nine — ' — reflecting — although — intensity modulation — carrying out — having had — blue — a part — the flux of light — 11 — ' — penetrating . While brightness is collinearized after the color mirror 63, RGB partial flux of light 7' by which the color modulation was carried out is obtained. RGB partial flux of light 7' has the brightness and the color effectiveness corresponding to the information included in color video signal D. Mitsunari — a part — intensity modulation (based on the intensity modulation means 26, 27, and 28) — and — a collinear — intensity modulation — and — a color — a modulation — carrying out — having had — a part — the flux of light — two — ' — three — ' — and — six — ' — being generated — composition (based on the superposition means 76, 77, and 78) — each — video — a channel — A — B — and — C — ******** — the same — carrying out — having . video — a channel — D — a part — the flux of light — eight — ' — nine — ' — ten — ' — and — 11 — ' — spatial — superposition — carrying out — a top — functioning — a deviation — a mirror — 65 — a color — a mirror — 63 — 64 — three-fold superposition means 75 — constituting . A means to perform three-fold superposition about the video channels D, C, B, and A constitutes the element group 312 for piling up the partial flux of light of the primary color modulated in four projectors.
[0089] The point arranged on the carrier with which at least one of the division means 311, the intensity modulation means 25, 26, 27, and 28, and the superposition element groups 312 has four superposition means [three-fold] 75, 76, 77, and 78 is important. This configuration can be carried out with an optical element or a conventional new integrated optics system, and a conventional microoptics element. the [German patent application public presentation official report] — many examples which used the integrated optics system and the microoptics element are stated to DE 19503929ANo. 1.
[0090] a video signal — D — C — B — or — A — having corresponded — being the further — processing — carrying out — a sake — brightness — and — a color — information — becoming irregular — having had — four — a ** — RGB — a part — the flux of light — two — ' — three — ' — six — ' — and — seven — ' — superposition — a sake — an element — a group — 312 — an output side — setting — forming — having . For that, all the flux of lights must be generated by the one light source 300. RGB — a part — the flux of light — two — ' — three —

' — six — ' — and — seven — ' — an achromatic lens — an optical fiber — introducing — having . Each optical fiber forms optical fiber connection between the double light source 301 in which intensity modulation is possible, and four projectors 315,316,317 and 318.
[0091] Projectors 315,316,317 and 318 have the means 35, 36, 37, and 38 for a spatial flux of light modulation, respectively. In this example, the means 35, 36, 37, and 38 for a spatial flux of light modulation are biaxial deviation systems which consist of a polygon mirror and a tilt mirror. The intensity modulation injected from an optical fiber and the flux of light by which the color modulation was carried out progress to the tilt mirror for the polygon mirror for the Rhine deviation, and also a frame deviation by the flux of light deformation optical element. These element groups are roughly shown in drawing 3 . The polygon mirror and the tilt mirror are electrically connected to the corresponding control units 105,106,107 and 108, respectively. About how processing of video signal A which is an input video signal, video signal B, video signal C, and video signal D is performed, it mentions later based on drawing 7 .
[0092] Drawing 4 shows the video projection system for projecting the two or more same images as the principle shown in drawing 3 . In this example, the double light source 401 in which intensity modulation is possible includes three laser light sources 405,406 and 407 and the means 411 for dividing four directions of each flux of light into the primary color of red, green, and blue. As for this configuration, a laser light source 405 differs from the configuration of drawing 3 in that a laser light source 406 is formed in green, and the laser light source 407 is formed for blue in red. In this case, the three primary colors will follow a separate optical path. Therefore, the color mirror for dividing the flux of light into primary color is not required. In this example, the flux of light is divided by a half mirror 62 and the deviation mirror 65 like drawing 3 based on reinforcement 50%.
[0093] In this case, 17 mirrors are used. Although 22 mirrors are used with the configuration based on drawing 3 , cost may become larger in order to have to separate the three primary colors.
[0094] Completely like the operation gestalt of drawing 3 , a video projection system is seen to the travelling direction of light, and is arranged after the division means 411. Although a video projection system for drawing 5 to project two or more images is shown, the three primary colors are sent to the intensity modulation means 25, 26, 27, and 28 in order in time. A laser light source 500 is the radiation source of the double light source 501 which can carry out intensity modulation, and generates a part for red, green, and blue Mitsunari continuously in time. The intensity modulation means 25, 26, 27, and 28 are controlled by time amount duplication actuation according to the video signals A, B, C, and D in this time, and the synchronizing signal obtained from the means 35, 36, 37, and 38 for deflecting the RGB partial flux of light.
[0095] In this case, the means 511 for dividing four directions of flux of lights only has three a half mirror 62 and three deviation mirrors 65. Other reference agreements show the same component as the thing in drawing 3 .
[0096] It becomes possible to build the video projection system for projecting the image which gives a three-dimension image impression according to the description of this invention again. the same configuration — as an example — the [Europe patent application public presentation official report] — although indicated by EP 0473343ANo. 1, one projector is used with this configuration. Drawing 6 shows the video projection system for the monochrome stereoscopic vision image display equipped with two projectors 316,317 as an example, and the image E which the light which has the vertical polarization direction forms, and the image F which the light which has the horizontal polarization direction forms pile it up on a plane of incidence 59. In order to perform the 3rd Motomi, a watcher wears the glasses equipped with the polarizing filter which takes out a part for Mitsunari of one image to one side of a watcher's eye.
[0097] The video projection system in this case is equipped with the light source 600 which generates the light which has the two polarization directions which intersect perpendicularly mutually although wavelength is single. The double light source [the means 611 for dividing the light source 600 and the flux of light 1] 601 which can carry out intensity modulation with the intensity modulation means 26 and 27 is constituted. A vertical polarization component is separated from a horizontal polarization component by the beam splitter 66. The split ratio of the

flux of light 1 is 50%. One side of the partial flux of lights 2 and 3 carries out incidence to one side of the intensity modulation means 26 and 27 arranged after the division means 611. The intensity modulation means 26 and 27 are controlled by the electronic control unit 109 which controls the intensity modulation means 26 and 27 based on video signal S. Other reference agreements show the component group already described based on drawing 3 about the interaction. The three-dimensional display of a color picture is possible by combination with the video projection system shown in the video projection system, drawing 3 , or drawing 4 based on drawing 6 .

[0098] Drawing 7 shows the four-channel image preservation section 110 used when four images are projected in the configuration based on drawing 3 or drawing 4 as an example. In an input side, the video source is connected to the input sectors 85, 86, 87, and 88 of the image preservation section 110 by each video signals A, B, C, and D as a RGB color signal and a synchronizing signal sync. In an output side, a RGB color signal is taken out from the output sectors 95, 96, 97, and 98 4 times. The synchronization of an output side is performed by facet clock signal Taktr obtained from the rotation location of each polygon mirror in a deflection means, and s, t and u. One of the output sectors 95, 96, 97, and 98 is related with the input sectors 85, 86, 87, and 88, respectively. The input sector 85 and the output sectors 86 are some electronic control units. Other sectors are attached to electronic control units 106,107 and 108, respectively.

[0099]

[Effect of the Invention] By the video projection system based on this invention, the initial cost accompanying starting actuation of a multi-channel projection system, continuous action, and maintenance is reduced sharply.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the video projection system for projecting two or more images on a detail more about a video projection system.

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PRIOR ART

[Description of the Prior Art] In such a projection system, the light source for generating at least one flux of light, the intensity modulation means and spatial flux of light modulation means controlled by the video signal, and at least one plane of incidence for displaying each image of a predetermined number are arranged in accordance with an optical path.
[0003] The projector (projector) equipped with the light source based on the following two principles of operation is known. Namely, 1. Projectors based on the conventional imaging principle, such as a LCD projector and a DLP projector. These projectors are called a "image-imaging projector" below. 2. Projector using the flux of light deflected by two-dimensional. These projectors are called a "laser display" or a "laser projector."
[0004] The above-mentioned projector can be designed for the purpose of projecting a monochrome image and monochrome image chiefly. It is enough to change electronic image information into a luminous-intensity modulation or intensity modulation in such a case. It depends for the impression of an image on adjustment of the brightness of the image to the situation of a surrounding light the 1st. The maximum brightness of an image is restricted by the optical output modulated 100%. The impression of an image is further determined by the level of contrast. Modulation width of face is fixed in adjustment of contrast. That is, the gray value of a video signal is correlated with the optical output modulated by corresponding.
[0005] What is necessary is to receive mutually and just to adjust the parameter of the brightness of a projector, contrast, and spectral intensity distribution, when projecting the image with the same projector of two or more same classes arranged by adjoining each other mutually. Therefore, possible adjustment of 12 may exist in four projectors to four images.
[0006] Furthermore, the image modulation means and the related electronics control section of a projector need to operate in the completely same property. Only by this, it becomes actually possible to project the image with two or more same projectors which receive the same video information.

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EFFECT OF THE INVENTION

[Effect of the Invention] By the video projection system based on this invention, the initial cost accompanying starting actuation of a multi-channel projection system, continuous action, and maintenance is reduced sharply.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The degree of freedom at the time of adjusting a projector increases large about 3 times, when generating a color image. In the case of a color picture projector, this is explained by when three monochrome systems of a different color, i.e., the system for primary color red (R), and system ** the system of ** and for primary color green (G) primary color blue (B) are together. Therefore, nine possibility can be considered when adjusting the color effectiveness of an image, contrast, and brightness. Therefore, the degree of freedom of adjustment with four projectors is already set also to 36. The property of the image of the following in relation to people's check-by-looking capacity must be almost the same in two or more projectors. That is, they are ****** of contrast (light-and-darkness ratio), gradation (channel gradation), a convergence (overlap of a color), and an image, the presentation (pixel structure) of an image, brightness (luminous intensity), color reinforcement (saturation), and a color tone (hue). Especially the color difference between the projectors which project an image so that each other may be adjoined directly mutually (difference of colour stimulus specification) is detected by people by very high sensibility. The purpose which carries out the maximum coincidence of the projection property of two or more projectors is actually attained only by spending a considerable technique, cost, an effort, and time amount.
[0008] In order to project a big image, the whole image is usually formed combining two or more separate images. Each image is formed by one projector, respectively for this purpose.
[0009] The configuration equipped with two or more LCD projectors as an example is known. the [Europe patent application public presentation official report] -- according to EP 0731603ANo. 2, such a projector has the source of the white light where red, green, and the blue three primary colors are taken out, respectively. The configuration equipped with the three light sources which each gives one primary color is also known. These light sources are temperature radiators. There is a big problem in the solution using a temperature radiator. The watcher of a projection image expects brightness and an image with a uniform color expression. However, this is not realized when the projector which forms each image has each light source. Each brightness and color reproduction property of the light source of each projector become the same, and it is hard to think that it is maintained still more nearly everlastingly with the same condition.
[0010] The greatest trouble is that the degrees of aging of a projection lamp differ and change which cannot be predicted occurs in spectral intensity distribution through this process. Even if it is the same class and use age, it is shown by the experiment that the color temperatures of each projection lamp differ sharply in a radiation property. Consequently, the color which changes in each image with each projectors is reproduced. The methods of change of the color temperature of the projection lamp of each [the process of aging] differ greatly.
[0011] Another cause of the difference of spectral intensity distribution is each difference and tolerance in the electric power supply to the light source or a cathode-ray tube of a projector. All of these effects are connected with the futility of time amount and an ingredient when an operator adjusts and maintains the brightness of each projector of this kind of equipment, and the balance of the color effectiveness. The image which consists of each image must actually fulfill the suitable conditions about quality. The process which makes each image in agreement is a complicated thing which time amount requires very much. When increasing brightness by

changing the supply voltage or the supply current to a projection lamp as an example, a color temperature also changes. This effect can be compensated only by the new color-matching approach of a projector. When a projection lamp breaks down and it is exchanged for a new thing, since new projection lamps differ greatly in an optical output and a color temperature as compared with what is already used over the long period of time, this process will become still more uneconomical. Therefore, when one projection lamp breaks down, all the projection lamps of a system must often be exchanged. This also leads to increase of cost.
[0012] the [furthermore, / Europe patent application public presentation official report] -- according to EP No. 0589179, it is possible to transpose the projection lamp (temperature radiator) of an image imaging projector to a laser light source. A laser light source has the advantage that it is possible to emit the light of predetermined wavelength as compared with a temperature radiator. That is, the laser light source from which the same class differs can emit the light of the completely same wavelength. This gives the big advantage that spectral intensity distribution is the same, in the laser light source which has the same structure.
[0013] However, when a monochrome system is used also in this case, a difficulty arises, and when operating two or more laser light sources which receive each two or more images so that the whole image may give an impression with uniform brightness, big technical cost is required.
[0014] The image imaging laser projection system which forms a color picture also needs red, green, and three laser light sources of blue primary color to each projector. as this example -- the [Europe patent application public presentation official report] -- there is a DLP system based on EP 0589179ANo. 1. In this system, three laser light sources generate the laser beam bundle from which wavelength differs. This flux of light is spatially compounded by the optical element, and is expanded even to the magnitude of a DMD array. A DMD array carries out image formation on a plane of incidence with a projection objective lens.
[0015] The strong ratio which receives mutually [three laser light sources of a projector], the maximum reinforcement (brightness of an image) of each projector, and modulation width of face (contrast) must be mutually made completely in agreement in the multiple configuration of these projectors. About this, in order to obtain homogeneity and a strong uniform exposure over the whole surface of the objective plane inside each projector, a special problem arises by expanding each laser beam bundle even to the magnitude of a DMD array.
[0016] In this case, although it is thought that adjustment becomes easy with the fixed wavelength of a laser light source, in order to balance the RGB laser light source of two or more projectors so that it may have the reappearance property that all images are almost the same, to a color picture, an effort great also in this case is needed.
[0017] Furthermore, the projector using the write-in flux of light is known (the [an example / United States patent] USPS No. 5,424,771). Since an image is formed in the Rhine dimension of a laser beam bundle parallel as a matter of fact, the main advantages of such a laser projector at the time of comparing with an image imaging projector are that optical IMEJINGU of the object from an objective plane to an image plane is not performed. However, about the problem which adjusts the same reappearance property in two or more projectors, some improvement is only found as compared with the configuration mentioned above. The projector with which the main advantages about this point operate using the write-in flux of light is a point which does not have an objective plane inside equipment and the problem of a uniform exposure of an objective plane does not produce. It has the further advantage that the focal depth of this kind of projector is infinite as a matter of fact, and an always clear image is obtained.
[0018] However, when two or more projectors are used, in spite of being controlled by the same video signal, it is shown by the experiment that the difference which is visible to an eye in a reappearance image arises, and a degree of freedom is able to reduce this in the adjustment for every projector only with the means of 9 which starts comparatively as for a hand.
[0019] The difficulty in making a projection property in agreement in two or more projectors is mainly based on the difference between the beam-of-light parameters of the laser beam bundle of two or more same laser light sources. Fundamentally, these parameters are the diameter of the flux of light, emission, a polarization condition, and mode structure. Also in this case, when maintaining the condition that two or more images look the same, the further effort is needed for

sufficient extent making these parameters in agreement about a different laser light source. There is a point that the stability of each laser light source of operation must be maintained over a long time as another trouble.
[0020] In the simulator of a truck, a HEL, the aircraft, or a vessel, in order to simulate a horizontal image include angle so that it may actually be visible in an actual situation, an image is projected in a cylinder or a spherical side. The image in this case is constituted by two or more images from a different projection device for the big viewing angle needed in order to acquire the impression of an actual image.
[0021] The configuration for projecting an image on U.S. Pat. No. 4,297,723 in an above-mentioned way using a projector is indicated. Intensity modulation of red, green, and the three blue laser beam bundles is separately carried out to a left-hand side image, a right-hand side image, and a central image. The light of the red of each image by which intensity modulation was carried out, green, and blue is spatially compounded by the color mirror. The three parallel flux of lights in which each contains the image information of each image are formed. Both these flux of lights are deflected by two-dimensional by the biaxial scan system. Next, the three flux of lights are deflected towards the plane of incidence which curved with the incident light study element specially constituted so that three images might form the whole image. A central image is projected in the direction given by the scan system. A right-hand side image and a left-hand side image are spatially separated from a central image by the deviation mirror. In order to be constituted so that a joint may be lost to extent which can permit the whole image, these mirrors must be correctly adjusted to the shaft of the main incident light line. Angle of projection must not far exceed 50 degrees for the deviation mirror needed in order to divide an image.
[0022] Since it is technical, when it is many for which only one projection device is used, it is difficult to perform image projection about the level viewing angle of 200 degrees. Two pieces (example: the [Europe patent] EP 0210088BNo. 1) on which each projects the image according to individual, three pieces, four pieces, and more projection channels (example: the [Europe patent application public presentation official report] EP 0522204ANo. 1, U.S. Pat. No. 5,424,771) than this are used, each image is joined, and the whole image is sometimes formed. With the conventional technique, a number of the projectors and the light sources needed by the projection channel are used for this purpose. A projector is constituted so that it may ask by image projection and an image may be arranged together.
[0023] the [Europe patent application public presentation official report] — if based on EP 0522204ANo. 1, six projectors will be arranged in the center of a projection dome. In this case, according to drawing 31, six pieces or the RGB laser light source beyond it which operates independently is used, and a RGB laser light source has the laser light source of primary color which operates independently, respectively. Two or more projectors which have the power source and control section of laser which each became independent of are used.
[0024] If it is based on the phase of development at present so that it may guess from the above explanation, in order to perform projection covering the whole surface of a very big image, especially a dome, it is required to use two or more projection devices. However, especially with this kind of equipment, cost benefits large superfluously the installation of a projection system and maintenance which have the independent light source.
[0025] Therefore, each of this invention is the same about the property of brightness, contrast, and color reproduction, and it solves the problem which gives the video projection system for projecting two or more images with which each is similarly maintained about these properties at the time of actuation.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is a video projection system for projecting two or more images, and offers the video projection system by which the light source which generates at least one flux of light, the intensity modulation means and spatial flux of light modulation means controlled by the video signal, and at least one plane of incidence for displaying each image of a predetermined number are arranged in accordance with an optical path. If based on this invention, a video projection system is the projector of the predetermined number corresponding to the number of each images, it will have the projector with which each has a means for a spatial flux of light modulation, and these means will be optically connected to the light source. Furthermore, the means for dividing the flux of light into the partial flux of light of the predetermined number corresponding to the number of projectors is arranged after the light source in accordance with an optical path. Each of the partial flux of light has a partial optical path, the means for intensity modulation is arranged following each partial optical path, and the means for intensity modulation and the means for a spatial flux of light modulation are controlled by the signal of the video source while they are arranged along with one of the partial optical paths.
[0027] One of the advantages of this invention is a point which receives light from the one main light source, although two or more projectors are separated about spatial arrangement, the projection direction, or the plane of incidence. According to the class of projection device, at least one video signal for two or more projectors is generated, and the means for the means for intensity modulation or a space flux of light modulation is supplied. The number of these means is equivalent to the number of projectors.
[0028] The one video source does not mean that the one source is used for image generation, and means that it is possible to use the video source with which the predetermined numbers corresponding to the number of projectors differ. That is, it is possible to relate the one video source with each projector. The source can use a television oscillator and a videocassette recorder as an example.
[0029] Furthermore, it is possible to divide the video information on a whole image into the video information unit of a predetermined number to each image corresponding to the number of projectors, and each projector is controlled by this video information, respectively. In this case, a projector can be arranged with sense by which a whole image is constituted from each image. The reappearance property of a projector over the image of each [here] becomes almost the same. The difference in the brightness by the light source, contrast, or a color is lost.
[0030] Some fundamental possibility can be considered about the projection system use based on this invention. Namely, 1. Each of a projector can project the same image or a different image, a projector is arranged in this case in a different location, and each projector projects each image on a corresponding plane of incidence. Especially since the one light source is only needed when projected on the location where two or more images which may have different contents of an image differ, this configuration is economical. Therefore, especially the cost for obtaining a required optical output is sharply reduced, when a laser light source is used. 2. Each of a projector can still form each image which forms some big whole images. A big whole image is constituted by each image on each plane of incidence when the projector is arranged with the

suitable sense to the plane of incidence. The main advantage in this case is a point that each image is formed by brightness, contrast, and the projector with the same property of the color effectiveness. 3. Arrange on the plane of incidence of each [the sense which can pile up each image which is different on one plane of incidence in each of a projector]. Therefore, it is possible to form a color picture as an example with three monochrome projectors which give the image of primary color. Moreover, it is possible to form a stereoscopic vision image using an ellipsometric method or the color method.

[0031] The means for dividing the flux of light can be constituted combining a half mirror, a color mirror, a splitter cube, a diffraction grating, or a polarizer. These means must have the property divided into the different partial flux of light divided based on reinforcement, a phase location, the polarization direction, or wavelength while following an optical path which is different in the flux of light from the light source. Although some of these means are explained more to a detail in an example, if it is this contractor, other configurations and combination for dividing the flux of light which realize the smallest configuration very economically will be obvious. Generally, it is possible to acquire the optical path which does not take a spatial location while treatment is easy using the further polarization mirror.

[0032] The means for dividing the flux of light functions, when dividing the flux of light from the light source into a predetermined ratio to an intensity modulation means. In order to project an image in the same property, the split ratio to all the partial flux of lights is chosen so that it may become the same as the number of projectors. When forming the image with which brightness differs from a color impression, it is also possible to define different split ratio.

[0033] Division is determined that it will not change in time by the half mirror or the color mirror as an example. It is possible to make adjustment and modification of split ratio with the control unit and adjustment means for dividing the flux of lights, such as the laser optic company (Laseroptik GmbH, Garbsen) make D-30826, as an example, while projecting an image. However, once split ratio is set up, adjustment brightness and an adjustment color impression will become lasting.

[0034] The means for intensity modulation is the same as the means for a space flux of light modulation in the image imaging projector stated to the above-mentioned item 1. These means form the internal objective plane of all projectors, and form each image. These means are realized by a LCD matrix, a DMD array, or other light sources that emit light passively.

[0035] In itself, all the means that affect the intensity distribution of the expansion flux of light in the cross section as the image source which does not emit light are included. As an example, although the slide of a positive, a diaphragm or a shutter, a light valve, etc. are contained, the matrix which generates light actively [diode, a transistor a miniature electron tube, etc.] is not included.

[0036] Each image can be directly seen in a LCD matrix as an example. However, in order to obtain a big image, each image formed in the internal objective plane of a projector is expanded on a plane of incidence with a projection objective lens.

[0037] It is a chisel that the expansion element of the predetermined number corresponding to the number of projectors is arranged following the division means of a partial optical path to each partial flux of light, when the path of the partial flux of light is [and] smaller than the magnitude of the objective plane inside equipment in an image imaging projector, and each expansion element expands the partial flux of light even to the magnitude of the internal objective plane of each projector. Expansion of the partial flux of light to the magnitude of a corresponding internal objective plane enables it to irradiate an internal objective plane according to other partial flux of lights in other projectors, and the partial flux of light which has the same property.

[0038] In the laser projector stated to the above-mentioned item 2, a space flux of light modulation means contains the biaxial actuation deviation system which deflects the corresponding partial flux of light to two-dimensional. The line recognized by the watcher as a frame or an image on a plane of incidence according to this written-in partial flux of light is formed as a close train.

[0039] A biaxial deviation system is combination with the tilt mirror for the polygon mirror for the

Rhine deviation, an image, or frame scanning at a detail. A biaxial deviation system can realize an above-mentioned means advantageously by arranging to a duplex. however, a biaxial actuation deviation system — the [international patent application public presentation official report] — it is also possible to constitute from a controllable means expressed to WO 96/No. 25009. In this case, it is important for the flux of light to become irregular only in that radiation direction.
[0040] In the projector which operates in the write-in flux of light, the means for intensity modulation is an electro-optics acoustooptics-modulator [a detail]. These modulators produce the partial flux of light in which intensity modulation was carried out by comparatively easy electric control.
[0041] furthermore, a luminous-intensity modulation or amplitude modulation — the [international patent application public presentation official report] — it is also possible to carry out based on one of the principles expressed to WO 96/No. 25009. Two kinds of light sources are used in this invention.
[0042] The light source of the 1st class is the radiation source which has the optical intensity-distribution curve expanded spatially. These radiation sources are realized as luminous-radiation objects, such as temperature radiators, such as a halogen lamp, or light emitting diode.
[0043] The light source of the 2nd class is the radiation source which produces the flux of light parallel as a matter of fact. If based on a current technique, this radiation source will be a laser light source. In a video projection system, especially a suitable laser light source has the property that emission of the flux of light is restricted by diffraction.
[0044] The video projection system based on this invention is suitable especially also when projecting a color picture. As for this kind of video projection system, the optical path of the flux of light containing the primary color of red, green, and blue is characterized [1st] by following the light source. A division means is arranged on this optical path, divides the flux of light into the partial flux of light of the predetermined number corresponding to the number of projectors, and divides each of these partial flux of lights into the three more partial flux of lights. Each of the partial flux of light has a partial optical path while containing red, green, and one color in blue primary color, and an intensity modulation means is arranged on each partial optical path. Furthermore, each of three partial optical paths to which it is shown to one of the partial flux of lights which are red, green, and one color of blue primary color is assigned to one of the projectors, and the intensity modulation means placed on these three partial optical paths is controlled by the color video signal from the video source.
[0045] The video projection system for projecting a color picture is characterized [2nd] by arranging the means for dividing the three flux of lights on these three optical paths while red, green, and the optical path over the flux of light of blue primary color separated spatially follow the light source. These means divide each of the three flux of lights into the partial flux of light of the predetermined number corresponding to the number of projectors. Each partial flux of light has a partial optical path, and an intensity modulation means is arranged on each partial optical path here. Furthermore, each of three partial optical paths to which it is shown to one of the partial flux of lights which are red, green, and one color in blue primary color is assigned to one of the projectors, and the intensity modulation means placed on these three partial optical paths is controlled by the color video signal from the video source.
[0046] In the case of the latter, the light source is the radiation source divided into an optical path with separate red, green, and blue color component from now on, or the light source consists of the three radiation sources from which each produces one of red, green, and blue in the independent optical path.
[0047] In order to acquire homogeneity and a permanent image reconstruction property as much as possible, in the range of this invention, especially use of the light source which is a RGB laser light source is advantageous. although a temperature radiator gives a continuous spectrum, a spectral region in three primary colors is taken out from this continuous spectrum — being sufficient . The big energy loss by heat is always mainly followed on actuation of a temperature radiator. However, a RGB laser light source gives only three Mitsunari of a several nanometers wavelength field. The wavelength of this laser beam can be maintained time almost uniformly based on the property of the laser matter.

[0048] The rate of an output to each in three primary colors can be adjusted very stably with an electronic control. as an example, the white balance of the light source of a projector to the standard intensity of illumination D65 equivalent to day ranges is [100% (632nm) of red] green -- the power ratio of 67.9% (445nm) of blue is needed 95.3% (532nm).
[0049] That an expansion element is arranged following a division means on the partial optical path of each partial flux of light of primary color One of the partial flux of lights of primary color is expanded even to the magnitude of the internal objective plane of the projector with which it is a chisel when the path of the partial flux of light is smaller than the magnitude of the objective plane inside equipment, and each expansion element corresponds in the image imaging projector stated to the above-mentioned item 1.
[0050] In the above-mentioned two modifications of the video projection system for projecting a color picture, an advantageous configuration is the point of being projected on the partial flux of light compounded spatially for the three partial flux of lights related with the projector and each color picture being assigned to a superposition means, and projecting each color picture on a plane of incidence.
[0051] Here, it does not mean that the partial flux of light piles up "superposition" of the partial flux of light on a plane of incidence on a direct plane of incidence, and the partial flux of light means that it is possible to pile up in the field between an intensity modulation means and a plane of incidence. The point that a synthetic color picture is formed on a plane of incidence from the partial flux of light of a different color regardless of the location of superposition as a result of this superposition is important. The partial flux of light of the color from which it differs on three partial optical paths is piled up by the following three approaches, and forms each color picture. That is, the partial flux of light of three different colors of primary color is directly piled up on this plane of incidence about each image with a color picture projector equipped with three projection channels for the image reconstruction by which 1 itself was turned to the plane of incidence of each image. 2) Pile up the image of three different colors of primary color about the image of each [the optical-path top between a spatial flux of light modulation means and a plane of incidence]. 3) Pile up the partial flux of light of three different colors of primary color about the image of each [the optical-path top between an intensity modulation means and a spatial flux of light modulation means].
[0052] Furthermore, the number of color components is not limited to the three primary colors. Since all other colour stimulus specification in the chromaticity diagram made by the three primary colors by using the three primary colors is obtained, this configuration is only one of the especially advantageous things. This invention can be realized using two colors other than the three primary colors, or three colors. In this case, when the image of high quality is not formed or more colors than three colors are used, cost increases.
[0053] It has set that it is arranged in three partial optical paths after the objective plane inside the equipment related with one of the projectors to each color picture while the means for piling up three images of primary color and forming each color picture forms each image of primary color to the image imaging projector stated to the above-mentioned item 1, and it is a chisel.
[0054] On the other hand, in the laser projector stated to the above-mentioned item 2, especially the point arranged after three intensity modulation means by which the superposition means was associated on three partial optical paths by one of the projectors is advantageous. A superposition means compounds the three partial flux of lights of primary color to a common optical path, and a space flux of light modulation means is arranged next.
[0055] In this case, since spatial integration is performed in this side of a spatial flux of light modulation means and the problem of a convergence does not arise on a plane of incidence, a problem is not produced when piling up the three flux of lights of primary color. However, it is also possible to carry out by piling up the image of a color which is different in a laser projector on a plane of incidence or after a spatial flux of light modulation means in one of the superposition of the flux of light of the color from which a **** differs.
[0056] In the laser projector described in the above-mentioned item 2, in order to adjust image size, as for a spatial flux of light modulation means, it is desirable to include the conversion optical element which decreases or increases a deflection angle.

[0057] Furthermore, a video projection device can have the light source which generates red, green, and the partial flux of light of blue primary color in order in time. It is also possible to perform time continuous generating of this partial flux of light with a division means. A time amount duplication mode of operation for this to project each color picture is obtained, and an intensity modulation means and a spatial modulation means are controlled based on a video signal. These video signals are generated corresponding to time amount duplication actuation. Since this kind of image formation has the small cost concerning adjustment of each color channel in such a case, it is advantageous especially in an image imaging projector. furthermore, this time amount duplication mode of operation — a component — about — it has the general advantage that reducing by 2/3 is possible.
[0058] or [whether in many applications, the light source is detached and arranged from a projector, or spatially, projectors are detached a little and they are installed, or / that it is required to carry out and to arrange flexibly spatially] — or it is recommended. For this reason, optical fiber connection is prepared in the part between the flux of light division means on each partial optical path, and a spatial flux of light modulation means. It is important for each partial flux of light to be combined with one or more optical fibers as completely as possible.
[0059] In the laser projector using a write-in laser beam bundle, optical fiber connection is especially prepared preferably between the intensity modulation means on a partial optical path, and a spatial flux of light modulation means. Moreover, optical fiber connection can also be prepared between a division means and an intensity modulation means.
[0060] A part of partial optical path [at least] located between a superposition means and a spatial flux of light modulation means in the video projection system which forms a color picture based on the laser projector stated to the above-mentioned item 2 has especially the advantageous thing formed of optical fiber connection.
[0061] However, no partial optical paths are necessarily required for having optical fiber connection. It is also possible to combine optical fiber connection with other optical transmission lines. Furthermore, in order to acquire a three-dimension image impression, it is also possible to use this invention advantageously in the video projection system which two images pile up. projecting each image with which the 1 polarization directions differ as an approach suitable when the laser light source is used especially (a laser light source giving the light which polarized generally), and 2 — although it has slightly different wavelength, there are two of projecting each image perceived as the same color (a laser light source generating light with small bandwidth generally) in people's eye.
[0062] the 1st approach — as an example — the [German patent] — although indicated by DE19537356C No. 1, the image with which the polarization direction formed by the projector here intersected perpendicularly mutually piles up. Also in this case, the one light source is used and it is advantageous on a plane of incidence coincidence and that two images are formed mutually-independent.
[0063] Here, the light source generates the light which has at least two different polarization directions, and each polarization is guided at an intensity modulation means. In this case, it is possible to control an intensity modulation means by the source on top of which an image is laid so that the 3rd Motomi may be made possible. The modulated flux of light is projected on a plane of incidence by each projector adjusted by receiving mutually.
[0064] However, it is possible to acquire the different polarization direction also by using the light source which gives the flux of light which carried out the circular polarization of light. In this case, the two different polarization directions are acquired by the flux of light division means.
[0065] the [German patent] — generating and division of polarization different here are performed before an intensity modulation means to the indication of DE19537356C No. 1. This divides and has the advantage that the image according to individual is generated by coincidence to a right eye and a left eye. here, in order to obtain the resolution of an image which is realized in two-dimensional projection, each image is alike, respectively, it receives, and one projector is used.
[0066] the 2nd approach — as an example — the [German patent application public presentation official report] — although indicated by DE 19808264ANo. 1, the image which has a

different frenum region wavelength field formed by the projector piles up here.
[0067] If based on this invention, the light source can generate the flux of light of different wavelength to which the difference of two different wavelength becomes smaller than 80nm. The two partial flux of lights arise with a flux of light division means, and it shows around at the intensity modulation means which can be controlled by the source on top of which an image is laid so that "the 3rd Motomi" may be made possible. The modulated flux of light is projected on a plane of incidence by each projector adjusted by receiving mutually.
[0068] The flux of light of the light source is divided into the partial flux of light in all cases by the configuration based on this invention. It is possible to reduce cost sharply according to this process as compared with a well-known configuration.
[0069] Electronic video information is changed into optical video information by the intensity modulation means or the spatial flux of light modulation means, and an image is formed from two or more projectors spatially arranged independently using this information. A very big advantage is acquired by using a laser light source, when generating the RGB flux of light. It is possible to maintain at stability the wavelength to which the laser light source was set beforehand over the whole life of a lamp. It is possible to make the color reproducing characteristics of a projector by this eternally the same between projectors in time. All the optical elements used, such as a deviation mirror, a half mirror, and a color mirror, are passive elements optically, it is not dependent on an output and the function does not change along with the passage of time.
[0070] The video projection system using two or more projectors can be constituted more simply. It is also possible to reduce sharply the cost accompanying such a video projection system use and maintenance by the system based on this invention.
[0071]
[Embodiment of the Invention] This invention is explained below at a detail based on drawing 1 thru/or drawing 7 . Drawing 1 shows the video projection system for projecting three images, and Images A, B, and C are formed of the write-in flux of light. optics — a signal — conveying — a part — the flux of light — two — ' — three — ' — four — ' — intensity modulation — carrying out — things — being possible — double — the light source — 101 — three — a piece — a projector — 115,116 — and — 117 — between — an optical fiber — connection — 45 — 46 — and — 47 — transmitting — having . Three projectors 115,116 and 117 are turned to planes of incidence 55, 56, and 57, respectively.
[0072] Furthermore, the double light source 101 which can carry out intensity modulation, projectors 115,116 and 117, the electronic control unit 105 for the video channels C corresponding to each, the electronic control unit 106 for video channel B, and the electronic control unit 107 for video channel A are connected electrically.
[0073] In this operation gestalt, three images can be projected mutually-independent about a direction, a location, size, and the contents of an image. It receives mutually and the installation location of the planes of incidence 55, 56, and 57 assigned to projectors 115,116 and 117 and each projector can be chosen comparatively independently. It is easily possible to take the distance of 60 meters among three projectors 115,116 and 117. The maximum distance from the double light source 101 which can carry out intensity modulation to projectors 115,116 and 117 must not far exceed 30 meters for the optical attenuation of an optical fiber available at present which leads to loss on the strength.
[0074] The double light source 101 in which the thing which was shown in the example based on drawing 1 , and which carry out intensity modulation is possible consists of a means 111 for dividing the light source 100 and the flux of light 1 into the three partial flux of lights, and three intensity modulation means 25, 26, and 27. The flux of light 1 injected from the light source 100 is divided by the means 111 for dividing the flux of light into the three partial flux of lights 2, 3, and 4 of the same reinforcement. Therefore, each of the partial flux of lights 2, 3, and 4 has one third of the reinforcement of the flux of light 1. The partial flux of lights 2, 3, and 4 form each images A, B, and C on planes of incidence 55 and 56 and 57.
[0075] In this example, the light source 100 is a monochrome laser light source with a wavelength of 532nm. In this example, a means 111 to divide the flux of light 1 into the three partial flux of lights consists of a 33% splitter mirror 61 which is a half mirror, and a 50% splitter

mirror 62. It is arranged forward and backward mutually [the splitter mirror 61 and the splitter mirror 62] on the optical path of the flux of light 1. In this case, 90 degrees of partial flux of lights 2 and 3 are deflected by the deviation mirror 65. The means 25, 26, and 27 for intensity modulation are related with each of the partial flux of lights 2, 3, and 4, respectively. In this example, an intensity modulation means is an acoustooptic modulator. Each of three intensity modulation means 25, 26, and 27 which operates mutually-independent receives an electrical signal from one of electronic control units 105,106 and 107. These electrical signals support the image information of each image displayed on planes of incidence 55 and 56 and 57. The electrical signal for intensity modulation is acquired from video signals A, B, and C.
[0076] as an example — the [German patent] — the approach of a video data and the method of controlling a modulator are stated to DE19537356C No. 1. If it thinks in the travelling direction of light, the edge of the optical input side of the optical fiber connection 45, 46, and 47 will be arranged after the intensity modulation means 25, 26, and 27 on an optical path. Modulated partial flux of light 2', 3', and 4' are inputted into the edge of an optical input side, respectively. In this example, each optical fiber connection 45, 46, and 47 consists of coupling-out optical elements of the optical output edge of the coupling-Inn optical element of an optical input edge, a multiplex-mode optical fiber, and an optical fiber. as an example — the [German patent application public presentation official report] — it is related and stated to DE 19616843ANo. 1 how optical fiber connection of this kind is constituted in a video projection system.
[0077] Each optical output edge of the optical fiber connection 45, 46, and 47 is connected to one of the projectors 115,116 and 117. In this example, projectors 115,116 and 117 are equipped with the means 35, 36, and 37 for a spatial flux of light modulation, respectively. Incidence of the partial flux of light which comes out of the optical fiber connection 45, 46, and 47 is carried out to the spatial flux of light modulation means 35, 36, and 37, respectively. The spatial flux of light modulation means in this example consists of tilt mirrors for the rotating type polygon mirror for the Rhine deviation, and a frame deviation. this kind of configuration — the [German patent] — although stated to DE4324849C No. 2, the conversion optical element for increasing the deflection angle of the flux of light is arranged after two deviation mirrors. When a conversion optical element is needed, it is also possible to constitute a part of each spatial flux of light modulation means from a conversion optical element. The partial flux of lights 15, 16, and 17 deflected in the direction of Rhine and the direction of a frame are alike, respectively, and each images A, B, and C are formed.
[0078] Drawing 2 shows the video projection system for projecting three images formed of a LCD matrix, and A, B and C. The projector which operates using a LCD matrix is contained under the category of an image imaging projector. Also in this example, a laser light source is used as the light source 200, and the optical fiber connection 45, 46, and 47 is used in the optical channel. In this case, the video projection system which can be set contains the double light source 201 (intensity modulation cannot be carried out) and three projectors 215,216 and 217 which generate the three partial flux of lights 2, 3, and 4. Each projector is turned to one of planes of incidence 55, 56, and 57. The optical connection between the double light source 201 and projectors 215,216 and 217 is obtained by three optical fiber connection 45, 46, and 47. It is possible to project three images mutually-independent about a direction, a location, size, and the contents of an image by this configuration.
[0079] It receives mutually and the installation location of the planes of incidence 55, 56, and 57 assigned to projectors 215,216 and 217 and each projector here can be chosen comparatively independently, as stated with reference to drawing 1 .
[0080] In the example based on drawing 2 , the double light source 201 has the means 211 for dividing the one light source 200 and flux of light into the three partial flux of lights. The flux of light 1 which comes out of the light source 200 is divided into the three partial flux of lights 2, 3, and 4 with equal reinforcement by the division means. That is, each of the partial flux of lights 2, 3, and 4 has one third of the reinforcement of the flux of light 1. In this example, the light source 200 is a laser light source with a wavelength of 532nm. The means for dividing the flux of light 1 contains the splitter mirror 61 and 50% splitter mirror 62 33%. It is arranged forward and backward mutually [the splitter mirror 61 and the splitter mirror 62] on the optical path of the

flux of light 1. In this case, incidence of the partial flux of lights 2, 3, and 4 is carried out to one of the optical input edges of optical fiber connection by the deviation mirror 65 and the coupling-Inn optical element.
[0081] In this example, each optical output edge of the optical fiber connection 45, 46, and 47 is connected to one of the projectors 215,216 and 217. In this case, each projectors 215,216 and 217 have the optical elements 225,226 and 227, the intensity modulation means 25, 26, and 27, the spatial flux of light modulation means 35, 36, and 37, and the incident light study elements 85, 86, and 87 for expanding the partial flux of lights 2, 3, and 4. In this case, the partial flux of lights 15, 16, and 17 always contain the full-sized image information of each image.
[0082] In this example, the intensity modulation means 25, 26, and 27 are the same things which were in agreement with spatial flux of light modulation means 35, 36, and 37 to correspond. These means are realized by the LCD matrix in this example. Each LCD matrix is arranged before the focus by the side of the target of the incident light study elements 85, 86, and 87. A LCD matrix is an objective plane inside equipment, and it is controlled by the electronics control section 105 so that the whole image is projected in the objective plane on which it is projected on planes of incidence 55 and 56 and 57 with the incident light study elements 85, 86, and 87. One electronic control unit 105 which processes video signal A in this example is formed. Therefore, it is projected on the same image by planes of incidence 55, 56, and 57. Each image is projected on different space as an example.
[0083] The optical elements 225,226 and 227 for expanding the partial flux of light are needed when the image field of a LCD matrix expands homogeneity and the partial flux of light injected from an optical fiber until it irradiates completely as much as possible. the image imaging projection system using the expanded laser beam bundle -- as an example -- the [Europe patent application public presentation official report] -- it is indicated by EP No. 0589179. In this case, a DMD array is used as an intensity modulation means and a spatial flux of light modulation means.
[0084] Drawing 3 shows the optical configuration of the video projection system for projecting four color pictures A, B, C, and D equipped with the double light source 301 in which intensity modulation is possible.
[0085] The light source 300 generates the red-green-blue light bundle 1 (RGB flux of light). In this example, the flux of light is a RGB laser beam bundle. Incidence of the flux of light 1 is carried out to the 1st half mirror 62. The 1st half mirror 62 divides the flux of light 1 into the two partial flux of lights 2 and 3 which have 50% of reinforcement of the incidence RGB flux of light 1, respectively. The 2nd half mirror 62 which forms the partial flux of lights 4 and 6 which have 25% of RGB reinforcement of the RGB flux of light 1, respectively is arranged on the optical path of the partial flux of light 2. Hereafter, an optical path is explained only about the optical element for the image display in the video channel D. 90 degrees of partial flux of lights 3 are deflected by the deviation mirror 65 50%. Then, incidence of the partial flux of light 3 is carried out to the further half mirror 62. The partial flux of lights 5 and 7 in which each has 25% of reinforcement of the RGB flux of light 1 are formed. Incidence of the partial flux of light 7 is carried out to the 1st color mirror 63 25%. As for the 1st color mirror 63, it reflects and the red partial flux of light 8 of the partial flux of light 7 penetrates green and the blue partial flux of light 9. Incidence of green and the blue partial flux of light 9 is carried out to the 2nd color mirror 64. As for the 2nd color mirror 64, it reflects and the green partial flux of light 10 penetrates the blue partial flux of light 11 towards the intensity modulation means 25. The green partial flux of light 10 and the red partial flux of light 8 are deflected towards the intensity modulation means 25 by the further deviation mirror 65 on an optical path. In this example, the intensity modulation means 25 has three independent modulators on the strength corresponding to each primary color in each.
[0086] Division of the flux of light of the video channel D described here is the same also about the video channels A, B, and C. The half mirror 62 which functions when dividing the flux of light 1, the deviation mirror 65, and the color mirrors 63 and 64 constitute the means 311 for dividing the RGB flux of light 1 into the four partial flux of lights.
[0087] The red partial flux of light 8, the green partial flux of light 10, and the blue partial flux of light 11 carry out incidence to the intensity modulation means 25R, 25G, and 25B, respectively,

with a red modulating signal, intensity modulation means 25G are controlled by the green modulating signal, and intensity modulation means 25R can control intensity modulation means 25B by the blue modulating signal.
[0088] The intensity modulation means in the video channels A, B, and C is constituted similarly. The superposition means 65 is arranged after the intensity modulation means 25 on three partial optical paths of primary color. The deviation mirror 65 is arranged on the partial optical path of red partial flux of light 8' by which intensity modulation was carried out. a part — an optical path — a top — a deviation — a mirror — 65 — after — **** — a color — a mirror — 64 — placing — having — intensity modulation — carrying out — having had — red — a part — the flux of light — eight — ' — penetrating — although — intensity modulation — carrying out — having had — green — a part — the flux of light — ten — ' — reflecting . intensity modulation — carrying out — having had — red — and — green — a part — the flux of light — nine — ' — a part — an optical path — a top — placing — having had — a color — a mirror — 63 — intensity modulation — carrying out — having had — red — and — green — a part — the flux of light — nine — ' — reflecting — although — intensity modulation — carrying out — having had — blue — a part — the flux of light — 11 — ' — penetrating . While brightness is collinearized after the color mirror 63, RGB partial flux of light 7' by which the color modulation was carried out is obtained. RGB partial flux of light 7' has the brightness and the color effectiveness corresponding to the information included in color video signal D. Mitsunari — a part — intensity modulation (based on the intensity modulation means 26, 27, and 28) — and — a collinear — intensity modulation — and — a color — a modulation — carrying out — having had — a part — the flux of light — two — ' — three — ' — and — six — ' — being generated — composition (based on the superposition means 76, 77, and 78) — each — video — a channel — A — B — and — C — ******** — the same — carrying out — having . video — a channel — D — a part — the flux of light — eight — ' — nine — ' — ten — ' — and — 11 — ' — spatial — superposition — carrying out — a top — functioning — a deviation — a mirror — 65 — a color — a mirror — 63 — 64 — three-fold superposition means 75 — constituting . A means to perform three-fold superposition about the video channels D, C, B, and A constitutes the element group 312 for piling up the partial flux of light of the primary color modulated in four projectors.
[0089] The point arranged on the carrier with which at least one of the division means 311, the intensity modulation means 25, 26, 27, and 28, and the superposition element groups 312 has four superposition means [three-fold] 75, 76, 77, and 78 is important. This configuration can be carried out with an optical element or a conventional new integrated optics system, and a conventional microoptics element. the [German patent application public presentation official report] — many examples which used the integrated optics system and the microoptics element are stated to DE 19503929ANo. 1.
[0090] a video signal — D — C — B — or — A — having corresponded — being the further — processing — carrying out — a sake — brightness — and — a color — information — becoming irregular — having had — four — a ** — RGB — a part — the flux of light — two — ' — three — ' — six — ' — and — seven — ' — superposition — a sake — an element — a group — 312 — an output side — setting — forming — having . For that, all the flux of lights must be generated by the one light source 300. RGB — a part — the flux of light — two — ' — three — ' — six — ' — and — seven — ' — an achromatic lens — an optical fiber — introducing — having . Each optical fiber forms optical fiber connection between the double light source 301 in which intensity modulation is possible, and four projectors 315,316,317 and 318.
[0091] Projectors 315,316,317 and 318 have the means 35, 36, 37, and 38 for a spatial flux of light modulation, respectively. In this example, the means 35, 36, 37, and 38 for a spatial flux of light modulation are biaxial deviation systems which consist of a polygon mirror and a tilt mirror. The intensity modulation injected from an optical fiber and the flux of light by which the color modulation was carried out progress to the tilt mirror for the polygon mirror for the Rhine deviation, and also a frame deviation by the flux of light deformation optical element. These element groups are roughly shown in drawing 3 . The polygon mirror and the tilt mirror are electrically connected to the corresponding control units 105,106,107 and 108, respectively.

About how processing of video signal A which is an input video signal, video signal B, video signal C, and video signal D is performed, it mentions later based on drawing 7 .
[0092] Drawing 4 shows the video projection system for projecting the two or more same images as the principle shown in drawing 3 . In this example, the double light source 401 in which intensity modulation is possible includes three laser light sources 405,406 and 407 and the means 411 for dividing four directions of each flux of light into the primary color of red, green, and blue. As for this configuration, a laser light source 405 differs from the configuration of drawing 3 in that a laser light source 406 is formed in green, and the laser light source 407 is formed for blue in red. In this case, the three primary colors will follow a separate optical path. Therefore, the color mirror for dividing the flux of light into primary color is not required. In this example, the flux of light is divided by a half mirror 62 and the deviation mirror 65 like drawing 3 based on reinforcement 50%.
[0093] In this case, 17 mirrors are used. Although 22 mirrors are used with the configuration based on drawing 3 , cost may become larger in order to have to separate the three primary colors.
[0094] Completely like the operation gestalt of drawing 3 , a video projection system is seen to the travelling direction of light, and is arranged after the division means 411. Although a video projection system for drawing 5 to project two or more images is shown, the three primary colors are sent to the intensity modulation means 25, 26, 27, and 28 in order in time. A laser light source 500 is the radiation source of the double light source 501 which can carry out intensity modulation, and generates a part for red, green, and blue Mitsunari continuously in time. The intensity modulation means 25, 26, 27, and 28 are controlled by time amount duplication actuation according to the video signals A, B, C, and D in this time, and the synchronizing signal obtained from the means 35, 36, 37, and 38 for deflecting the RGB partial flux of light.
[0095] In this case, the means 511 for dividing four directions of flux of lights only has three a half mirror 62 and three deviation mirrors 65. Other reference agreements show the same component as the thing in drawing 3 .
[0096] It becomes possible to build the video projection system for projecting the image which gives a three-dimension image impression according to the description of this invention again. the same configuration — as an example — the [Europe patent application public presentation official report] — although indicated by EP 0473343ANo. 1, one projector is used with this configuration. Drawing 6 shows the video projection system for the monochrome stereoscopic vision image display equipped with two projectors 316,317 as an example, and the image E which the light which has the vertical polarization direction forms, and the image F which the light which has the horizontal polarization direction forms pile it up on a plane of incidence 59. In order to perform the 3rd Motomi, a watcher wears the glasses equipped with the polarizing filter which takes out a part for Mitsunari of one image to one side of a watcher's eye.
[0097] The video projection system in this case is equipped with the light source 600 which generates the light which has the two polarization directions which intersect perpendicularly mutually although wavelength is single. The double light source [the means 611 for dividing the light source 600 and the flux of light 1] 601 which can carry out intensity modulation with the intensity modulation means 26 and 27 is constituted. A vertical polarization component is separated from a horizontal polarization component by the beam splitter 66. The split ratio of the flux of light 1 is 50%. One side of the partial flux of lights 2 and 3 carries out incidence to one side of the intensity modulation means 26 and 27 arranged after the division means 611. The intensity modulation means 26 and 27 are controlled by the electronic control unit 109 which controls the intensity modulation means 26 and 27 based on video signal S. Other reference agreements show the component group already described based on drawing 3 about the interaction. The three-dimensional display of a color picture is possible by combination with the video projection system shown in the video projection system, drawing 3 , or drawing 4 based on drawing 6 .
[0098] Drawing 7 shows the four-channel image preservation section 110 used when four images are projected in the configuration based on drawing 3 or drawing 4 as an example. In an input side, the video source is connected to the input sectors 85, 86, 87, and 88 of the image

preservation section 110 by each video signals A, B, C, and D as a RGB color signal and a synchronizing signal sync. In an output side, a RGB color signal is taken out from the output sectors 95, 96, 97, and 98 4 times. The synchronization of an output side is performed by facet clock signal Taktr obtained from the rotation location of each polygon mirror in a deflection means, and s, t and u. One of the output sectors 95, 96, 97, and 98 is related with the input sectors 85, 86, 87, and 88, respectively. The input sector 85 and the output sectors 86 are some electronic control units. Other sectors are attached to electronic control units 106,107 and 108, respectively.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The schematic diagram showing the video projection system based on this invention for projecting three images formed of a write-in laser beam bundle.
[Drawing 2] The schematic diagram showing the video projection system based on this invention for projecting three images formed by the image imaging projector which has a laser light source and optical fiber connection.
[Drawing 3] The schematic diagram showing the video projection system based on this invention for projecting four color pictures according to the write-in flux of light from a RGB laser light source.
[Drawing 4] The schematic diagram showing the video projection system based on this invention for projecting four color pictures according to the write-in flux of light from a red laser light source, a green laser light source, and a blue laser light source.
[Drawing 5] The schematic diagram showing the video projection system of this invention for projecting four color pictures by time amount duplication projection.
[Drawing 6] The schematic diagram showing the video projection system based on this invention for projecting the image which gives a three-dimension image impression.
[Drawing 7] The schematic diagram showing the control unit for the video projection system based on this invention for projecting two or more images.
[Description of Notations]
1 [— An intensity modulation means, 35, 36, 37 / — A spatial flux of light modulation means, 100, 200, 300,400,500,600 / — The light source, 105,106,107 / — The video source, 111 211, 311,411,511,611 / — The division means of the flux of light A, B, C / ... Video signal.] — The flux of light, 2, 3, 4 — The partial flux of light, 15, 16, 17 — A partial optical path, 25, 26, 27

[Translation done.]

* NOTICES *

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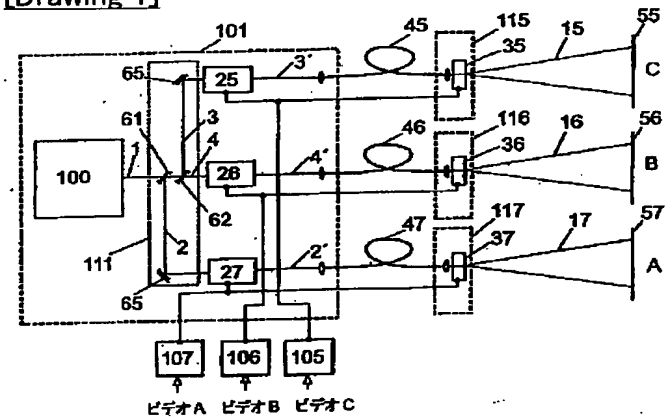
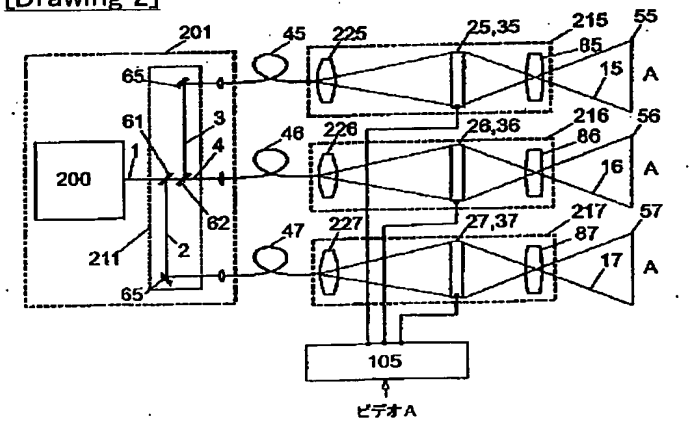
DRAWINGS

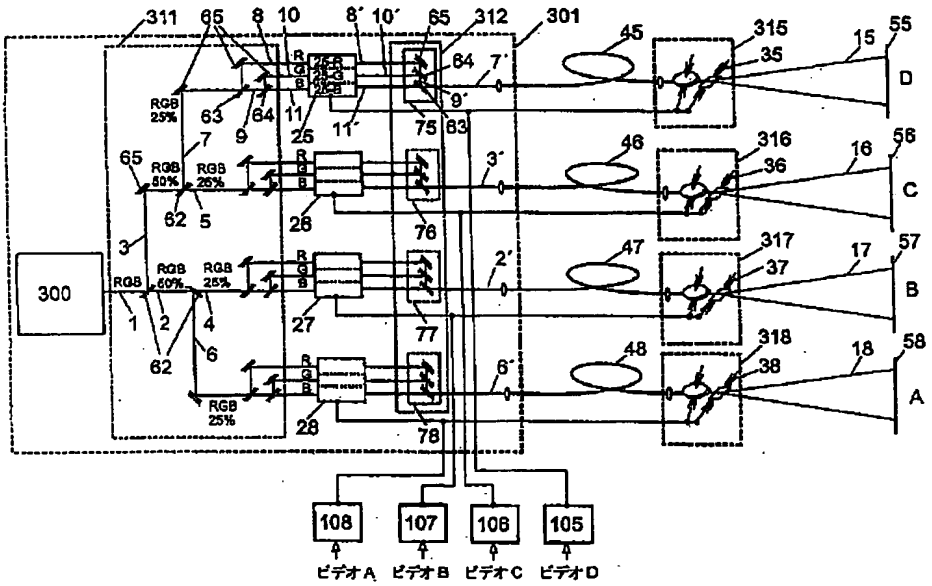
[Drawing 1]



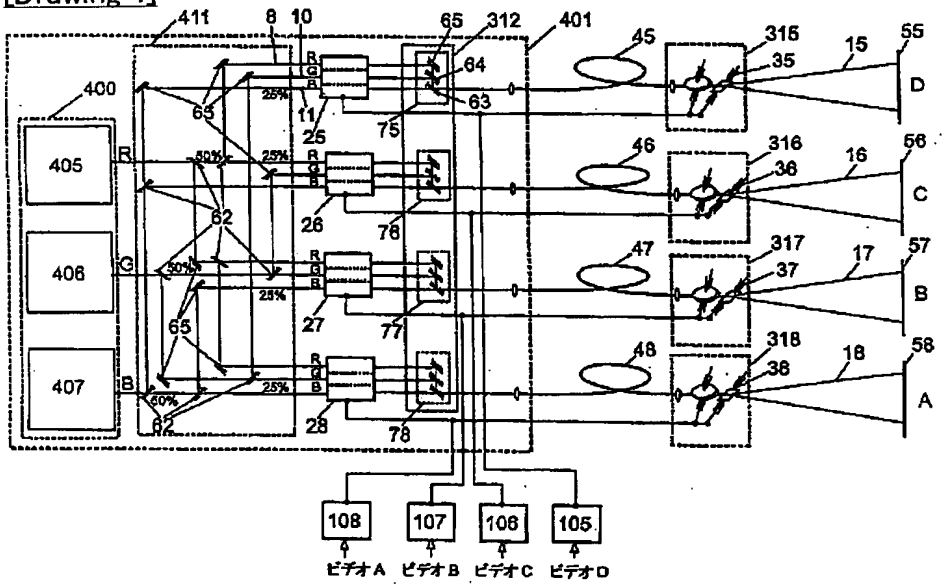
[Drawing 2]



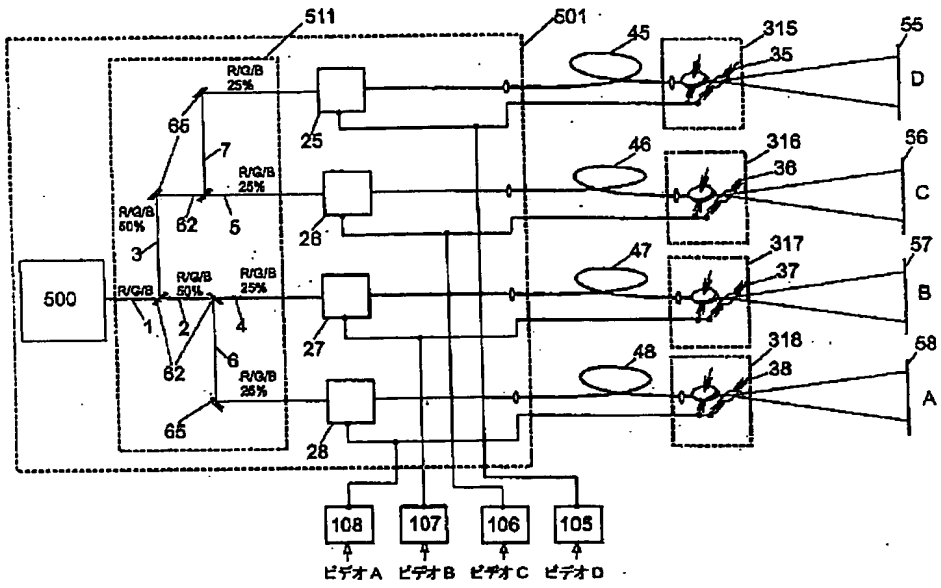
[Drawing 3]



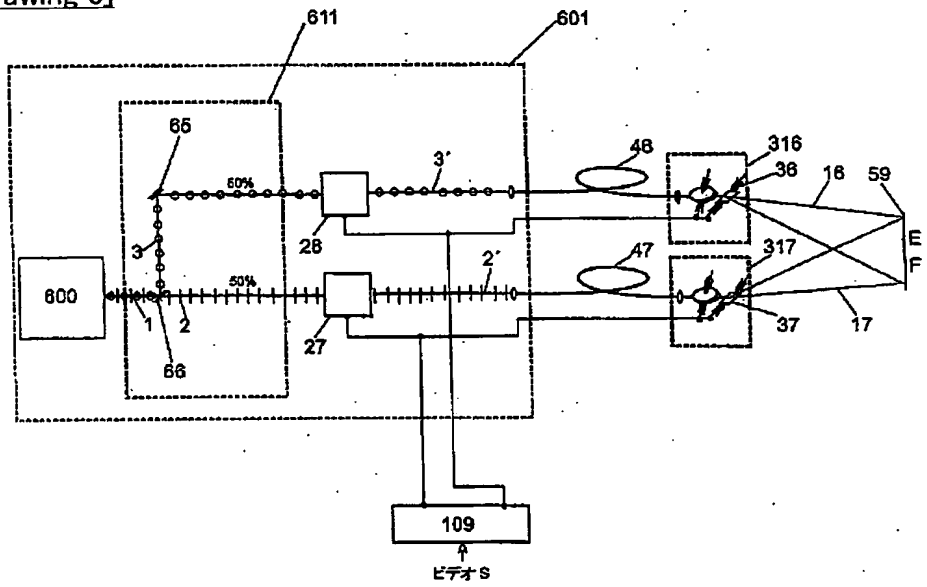
[Drawing 4]



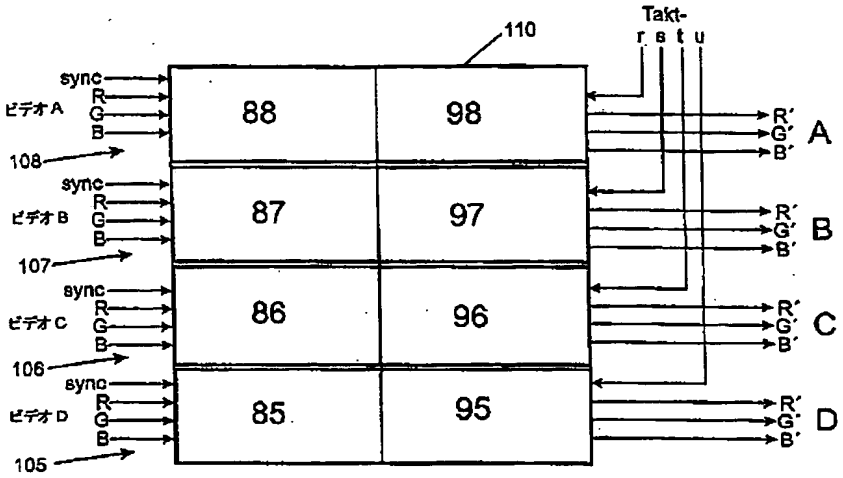
[Drawing 5]



[Drawing 6]



[Drawing 7]



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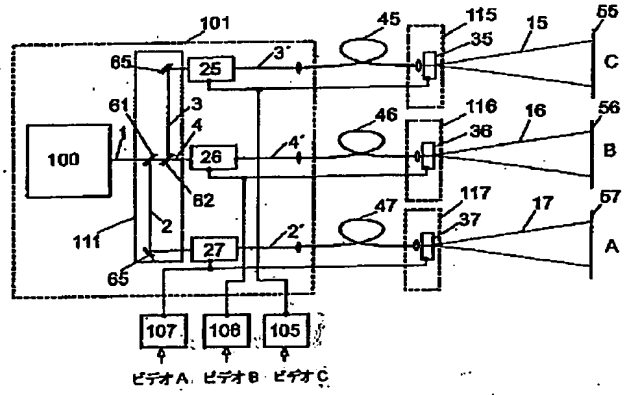
(71)出願人　596092399
エルディティ　ゲーエムベーハー　ウント　シーオー．レーザーーディスプレーーテクノロギー　カーゲー
ドイツ連邦共和国　Ｄ－07548　ゲラ　ファーザネンインゼル　1
(72)発明者　クリストハルト　データー
ドイツ連邦共和国　Ｄ－07546　ゲラ　ブレームシュトラーセ　27
(74)代理人　100068755
弁理士　恩田　博宣　（外１名）

(54)【発明の名称】　複数の画像を投射するためのビデオ投射システム

(57)【要約】
【課題】複数の画像であってそれぞれが輝度、コントラスト、色再現に関して同じ特性を有する複数の画像を投射するためのビデオ投射システムを提供する。
【解決手段】ビデオ投射システムはそれぞれが空間的光束変調手段（３５，３６，３７）を有するとともに個々の画像（５５，５６，５７）の数に対応した所定数の投射器（１１５，１１６，１１７）を備え、該手段は光源（１００）に光学的に接続される。光束（１）を投射器の数に対応した所定数の部分光束（２，３，４）に分割するための手段（１１１）が光路上で光源（１００）の後に配置される。各部分光束の部分光路（１５，１６，１７）上には強度変調手段（２５，２６，２７）が配置され、強度変調手段と空間的光束変調手段とは部分光路の１つに配置されるとともにビデオソース（１０５．１０６，１０７）の信号（Ａ，Ｂ，Ｃ）によって制御される。



1

【特許請求の範囲】

【請求項１】　少なくとも１本の光束を発生する光源と、ビデオ信号によって制御される強度変調のための手段及び空間的光束変調のための手段と、所定の数の個々の画像を映すための少なくとも１つの投射面とが光路上に光の進行方向に沿って配置されたビデオ投射システムにおいて、

ビデオ投射システムは前記所定数の個々の画像（５５，５６，５７）に対応した所定数の投射器（１１５～１１７；２１５～２１７；３１５～３１７）であってそれぞれが空間的光束変調手段（３５，３６，３７）を有する投射器（１１５～１１７；２１５～２１７；３１５～３１７）を備え、該空間的光束変調手段（３５，３６，３７）は光源（１００；２００；３００；４００；５００；６００）に対して光学的に接続され、更に、光束（１）を前記所定数の投射器に対応した所定数の部分光束（２，３，４）に分割するための手段（１１１；２１１；３１１；４１１；５１１；６１１）が光路に沿って光源（１００；２００；３００；４００；５００；６００）の下流に配置され、各部分光束（２，３，４）は部分光路を有し、各部分光路上には強度変調のための手段（２５，２６，２７）が配置され、該部分光路（１５，１６，１７）の１つに配置される前記強度変調手段（２５，２６，２７）及び前記空間的光束変調手段（３５，３６，３７）はビデオソース（１０５，１０６，１０７）の信号（Ａ，Ｂ，Ｃ）によって制御されることを特徴とするビデオ投射システム。

【請求項２】　前記光束を分割するための手段（１１１）は、半透鏡、色ミラー、スプリッタキューブ、回折格子、または偏光子にて構成され、前記部分光束は、強度、位相位置、偏光方向、または波長に基づいて分割されることを特徴とする請求項１に記載のビデオ投射システム。

【請求項３】　前記強度変調のための手段（２５）は前記空間的光束変調のための手段（３５）と同一であり、これらの手段は各投射器（２１５，２１６，２１７）の内部目標面上に個々の画像を形成し、かつ受動的に光を放射するＬＣＤマトリクス、ＤＭＤアレイ、または他のイメージソースにより実現されることを特徴とする請求項１または２に記載のビデオ投射システム。

【請求項４】　投射器（２１５，２１６，２１７）の内部目標面上に形成される個々の画像は投射対物レンズ（８５，８６，８７）によって投射面上に結像することを特徴とする請求項３に記載のビデオ投射システム。

【請求項５】　前記所定数の投射器に対応した所定数の拡大要素（２２５，２２６，２２７）が各光束（２，３，４）の部分光束上で前記分割手段（２１１）の後に配置され、前記各拡大要素（２２５，２２６，２２７）は各投射器（２１５，２１６，２１７）の内部目標面の大きさにまで部分光束を拡大することを特徴とする請求

2

項３に記載のビデオ投射システム。

【請求項６】　前記空間的光束変調のための手段（３５，３６，３７）は、各部分光束を２次元に偏向するとともに投射面上に個々の画像を形成する２軸動作偏向システムを含むことを特徴とする請求項１乃至５のいずれか１項に記載のビデオ投射システム。

【請求項７】　前記２軸偏向システムは、ライン偏向を行うためのポリゴンミラーとフレーム偏向を行うための傾動ミラーとから構成されるか、あるいは前記手段を２重に配置してなることを特徴とする請求項６に記載のビデオ投射システム。

【請求項８】　前記強度変調のための手段（２５）は電気光学変調器または音響光学変調器であることを特徴とする請求項６に記載のビデオ投射システム。

【請求項９】　前記光源（１００）は、特に温度放射体または光放射体などの、空間的に拡大された光強度分布曲線を有する放射源であることを特徴とする請求項１乃至８のいずれか１項に記載のビデオ投射システム。

【請求項１０】　前記光源（１００）は共線光束を放射する放射源であり、該放射源は特に光束の発散が回折によって制限される特性を有するレーザ光源であることを特徴とする請求項１乃至８のいずれか１項に記載のビデオ投射システム。

【請求項１１】　光源（３００）の後に赤、緑、青の原色を含む光束（１）の光路が形成されることと、前記分割手段はこの光路上に配置されて前記光束（１）を前記所定数の投射器に対応した所定数の部分光束に分割し、かつこれらの部分光束のそれぞれを更なる３本の部分光束に分割することと、該３本の部分光束はそれぞれ赤、緑、青の原色の１つを含むとともに部分光路を有し、各部分光路（８，１０，１１）上には強度変調手段が配置されることと、赤、緑、青の原色の１つである部分光束の１つが案内される３本の部分光路のそれぞれは投射器（３１５，３１６，３１７，３１８）の１つに割り当てられることと、該３本の部分光路上に配置される前記強度変調手段はビデオソース（１０５，１０６，１０７，１０８）からのカラービデオ信号（Ａ，Ｂ，Ｃ，Ｄ）によって制御されることとを特徴とする請求項１乃至１０のいずれか1項に記載のビデオ投射システム。

【請求項１２】　赤、緑、青の原色の光束（Ｒ，Ｇ，Ｂ）の空間的に懸隔した光路が光源に続くことと、該３本の光束（Ｒ，Ｇ，Ｂ）を分割するための手段（４１１）が前記３つの光路上に配置され、該分割手段は前記３本の光束のそれぞれを前記所定数の投射器に対応した所定数の部分光束に分割し、各部分光束は部分光路を有し、各部分光路（８，１０，１１）上には強度変調のための手段が配置されることと、赤、緑、青の原色の１つである部分光束の１つが案内される３本の部分光路のそれぞれは投射器（３１５，３１６，３１７，３１８）の１つに割り当てられることと、該３本の部分光路上に配

置される前記強度変調手段はビデオソース（１０５，１０６，１０７，１０８）からのカラービデオ信号（A，B，C，D）によって制御されることを特徴とする請求項１乃至１０のいずれか１項に記載のビデオ投射システム。

【請求項１３】　前記光源（４００）はこれから赤、緑、青の色成分が別々の光路に分離される放射源であるか、あるいは、独立した光路上に赤、緑、青の１色をそれぞれが与える３個の放射源（４０５，４０６，４０７）にて光源（４００）は構成されることを特徴とする請求項１２に記載のビデオ投射システム。

【請求項１４】　前記光源はＲＧＢレーザ光源であることを特徴とする請求項１乃至１３のいずれか１項に記載のビデオ投射システム。

【請求項１５】　原色のそれぞれの部分光束の各部分光路上の前記分割手段の下流に拡大要素が配置されることを特徴とする請求項５乃至１４のいずれか１項に記載のビデオ投射システム。

【請求項１６】　１個の投射器に関連付けられた変調された原色の３本の部分光束が重ね合わせ手段（７５，７６，７７，７８）に案内されることと、個々のカラー画像を映すために部分光束は空間的に合成されて前記投射面（５５，５６，５７，５８）上に投射されることとを特徴とする請求項１１または１２に記載のビデオ投射システム。

【請求項１７】　原色の３つの個々の画像を合成してカラー画像を形成するための前記重ね合わせ手段は、前記３つの部分光路上において、原色の個々の画像を形成するとともに投射器の１個に関連付けられた前記要素の内部の目標面の後に配置されることを特徴とする請求項３乃至１６のいずれか１項に記載のビデオ投射システム。

【請求項１８】　前記重ね合わせ手段（７５，７６，７７，７８）は前記３つの部分光路上において、投射器の１個に関連付けられた３個の前記強度変調手段の後に配置され、該重ね合わせ手段（７５，７６，７７，７８）は原色の３本の部分光束を共通の光路（１５）に統合し、前記空間的光束変調手段はこの後に配置されることを特徴とする請求項１６に記載のビデオ投射システム。

【請求項１９】　前記空間的光束変調のための手段（３１５，３１６，３１７，３１８）は偏向角を減少または増大させるための変換光学要素を含むことを特徴とする請求項６乃至１８のいずれか１項に記載のビデオ投射システム。

【請求項２０】　赤、緑、青の原色の部分光束が光源または分割手段によって部分光路上に時間的に順番に発生せられることと、空間的光束変調手段は時間重複動作のためのカラービデオソース（１０５，１０６，１０７）の信号によって制御されることとを特徴とする請求項１乃至１１、１３、１４または１９のいずれか１項に記載のビデオ投射システム。

【請求項２１】　前記光束を分割するための手段と前記空間的光束変調手段（３５，３６，３７）との間に位置する光路の少なくとも一部は光ファイバ接続（４５，４６，４７）により形成されることを特徴とする請求項１乃至２０のいずれか１項に記載のビデオ投射システム。

【請求項２２】　前記強度変調手段（２５，２６，２７）と前記空間的光束変調手段（３５，３６，３７）との間に位置する光路の少なくとも一部は光ファイバ接続（４５，４６，４７）により形成されることを特徴とする請求項６に記載のビデオ投射システム。

【請求項２３】　前記重ね合わせ手段（７５，７６，７７，７８）と前記空間的光束変調手段（３５，３６，３７，３８）との間に位置する光路の少なくとも一部は光ファイバ接続（４５，４６，４７）により形成されることを特徴とする請求項１８に記載のビデオ投射システム。

【請求項２４】　２以上の偏光方向を有する光束（１）が光源（６００）によて発生せられることと、前記分割手段はそれぞれが部分光路を有するとともに異なる偏光方向を有する部分光束（２，３）を形成することとを特徴とする請求項１，１１または１２のいずれか１項に記載のビデオ投射システム。

【請求項２５】　波長の差が８０ｎｍよりも小さい複数の光束が光源により発生せられることと、前記分割手段は異なる波長を有するとともにそれぞれが部分光路を有する部分光束を発生することとを特徴とする請求項１，１１または１２のいずれか１項に記載のビデオ投射システム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はビデオ投射システムに関し、より詳細には複数の画像を投射するためのビデオ投射システムに関する。

【０００２】

【従来の技術】こうした投射システムにおいては、少なくとも１本の光束を発生させるための光源と、ビデオ信号によって制御される強度変調手段及び空間的光束変調手段と、所定数の個々の画像を表示するための少なくとも１つの投射面とが光路に沿って配置される。

【０００３】以下の２つの動作原理に基づく光源を備えた投射器（プロジェクタ）が知られている。すなわち、１．　従来のイメージング原理に基づいた、ＬＣＤ投射器やＤＬＰ投射器などの投射器。以下これらの投射器を「画像ーイメージング投射器」と呼ぶ。２．　２次元に偏向される光束を用いる投射器。これらの投射器は例えば「レーザディスプレイ」または「レーザ投射器」などと称される。

【０００４】上記の投射器は専らモノクローム画像や白黒画像を映すことを目的として設計することが可能である。こうした場合、電子的画像情報を光の強度変調や輝

度変調に変換することで充分である。画像の印象は周辺の光の状況に対する画像の明るさの調整に第１に依存する。画像の最大輝度は１００％変調される光出力によって制限される。画像の印象は更にコントラストのレベルによって決定される。コントラストの調整においては変調幅は固定される。すなわち、ビデオ信号のグレイ値は対応して変調された光出力に相関する。

【０００５】互いに隣り合って配置された複数の同じ種類の投射器が同じ画像を映す場合、投射器の輝度、コントラスト、スペクトル強度分布のパラメータを互いに対して調整すればよい。したがって４つの画像に対する４個の投射器では、１２の可能な調整が存在し得る。

【０００６】更に、投射器の画像変調手段及び関連する電子制御部は全く同じ特性にて動作することが必要である。これによってのみ、同じビデオ情報を受ける複数の投射器が同じ画像を映すことが実際に可能となる。

【０００７】

【発明が解決しようとする課題】投射器を調整する際の自由度はカラーイメージを生成する場合、約３倍に大きくなる。カラー画像投射器の場合では異なる色の３つの単色システム、すなわち、原色赤（Ｒ）用のシステム、原色緑（Ｇ）用のシステム、及び原色青（Ｂ）用のシステム、が一緒になっていることによりこのことは説明される。したがって画像の色効果、コントラスト、及び輝度を調整するうえで９つの可能性が考えられる。したがって、４個の投射器で調整の自由度は既に３６にもなる。人の視認能力に関連した以下の画像の性質は複数の投射器においてほぼ同じでなければならない。すなわち、コントラスト（明暗比）、グラデーション（チャンネルグラデーション）、コンバージェンス（色の重なり合い）、画像の鮮輝度、画像の組成（ピクセル構造）、輝度（光度）、色強度（彩度）、色調（色相）である。特に互いに直接隣り合うように画像を投射する投射器間の色差（色刺激値の差）は人によって極めて高い感度で検出される。複数の投射器の投射特性を最大限一致させる目的は相当の技術、コスト、労力、及び時間をかけることによってのみ実際に達成される。

【０００８】大きな画像を投射するためには、通常、複数の別個の画像を組み合わせて全体の画像を形成する。この目的のため、個々の画像はそれぞれ１個の投射器により形成される。

【０００９】例として、複数のＬＣＤ投射器を備える構成が知られている。欧州特許出願公開公報第ＥＰ０７３１６０３Ａ２号によれば、こうした投射器はそれぞれ、赤、緑、青の３原色が取り出される白色光源を有する。それぞれが１つの原色を与える３つの光源を備えた構成も知られている。これらの光源は温度放射体である。温度放射体を利用した解決策には大きな問題がある。投射画像の観測者は輝度及び色表現が一様である画像を期待する。しかし、個々の画像を形成する投射器がそれぞれ

の光源を有する場合にはこれは実現されない。各投射器の個々の光源の輝度及び色再現特性が同じとなり、更には恒久的に同じ状態のままで維持されるとは考えにくい。

【００１０】最大の問題点は、投射ランプのエージングの度合いが異なり、この過程を通じてスペクトル強度分布に予測不能な変化が起きることである。同じ種類、使用年齢であっても個々の投射ランプの色温度は放射特性において大幅に異なることが実験により示されている。その結果、個々の投射器によって個々の画像において異なる色が再現される。エージングの過程で個々の投射ランプの色温度の変化の仕方は大きく異なる。

【００１１】スペクトル強度分布の差の別の原因は投射器の個々の光源または陰極線管への電力供給における差及び許容差である。これらの影響は全て、この種の装置の個々の投射器の輝度や色効果のバランスを操作者が調整、維持するうえで時間及び材料の無駄につながる。実際、個々の画像からなる画像は品質に関する相応の条件を満たすものでなければならない。各画像を一致させる過程は非常に時間のかかる煩雑なものである。例として、投射ランプへの供給電圧または供給電流を変化させることによって輝度を増大させる場合、色温度も変化する。この影響は投射器の新たな色合わせ方法によってのみ補償することが可能である。投射ランプが故障し、新たなものに交換される場合、新しい投射ランプは既に長期にわたって使用されているものと比較して光出力及び色温度において大きく異なるためにこの過程は更に不経済なものとなる。したがって１個の投射ランプが故障した場合、しばしばシステムの投射ランプを全て交換しなければならない。このこともコストの増大につながる。

【００１２】更に、欧州特許出願公開公報第ＥＰ０５８９１７９号によれば、画像イメージング投射器の投射ランプ（温度放射体）をレーザ光源に置き換えることが可能である。レーザ光源は温度放射体と比較して所定の波長の光を放射することが可能であるという利点を有する。すなわち、同一の種類の異なるレーザ光源は全く同じ波長の光を放射することが可能である。このことは同じ構造を有するレーザ光源ではスペクトル強度分布が同じであるという大きな利点を与える。

【００１３】しかし、この場合においても単色システムを用いた場合には難点が生じ、全体の画像が輝度の一様な印象を与えるように個々の複数画像に対する複数のレーザ光源を動作させるうえで大きな技術的コストを要する。

【００１４】カラー画像を形成する画像イメージングレーザ投射システムも各投射器に対して赤、緑、青の原色の３つのレーザ光源を必要とする。この一例として、欧州特許出願公開公報第ＥＰ０５８９１７９Ａ１号に基づくＤＬＰシステムがある。このシステムでは、３つのレーザ光源が波長の異なるレーザ光束を発生する。この光

7

束は光学要素により空間的に合成され、DMDアレイの大きさにまで拡大される。投射対物レンズによりDMDアレイが投射面上に結像する。

【００１５】これらの投射器の多重構成では、投射器の３つのレーザ光源の互いに対する強度の比、各投射器の最大強度（画像の輝度）、変調幅（コントラスト）は互いに完全に一致させられなければならない。これに関し、各投射器の内部の目標面の全面にわたって均一かつ一様な強い照射を得るために各レーザ光束をDMDアレイの大きさにまで拡大することにより特殊な問題が生じる。

【００１６】この場合、レーザ光源の一定の波長により調整は容易となるものと考えられるが、カラー画像に対して全ての画像がほぼ同じ再現特性を有するように複数の投射器のＲＧＢレーザ光源のバランスをとるためにはこの場合においても多大な労力を必要とする。

【００１７】更に、書き込み光束を用いた投射器が知られている（例、米国特許第ＵＳＰＳ５，４２４，７７１号）。画像イメージング投射器と比較した場合のこうしたレーザ投射器の主要な利点は、事実上平行なレーザ光束によりラインディメンジョンに画像が形成されるため、目標面から画像平面への対象物の光学的イメージングが行われないことである。しかし、複数の投射器において同じ再現特性を調整する問題については上述した構成と比較して若干の改善がみられるだけである。この点に関しての主要な利点は書き込み光束を用いて動作する投射器は装置の内部に目標面を有さず、目標面の一様な照射の問題が生じない点である。この種の投射器は、焦点の深さが事実上無限大であり、常に鮮明な画像が得られるという更なる利点を有する。

【００１８】しかし、複数の投射器を用いた場合、同じビデオ信号によって制御されるのにも関わらず、再現画像において眼に見える差が生じることが実験によって示されており、投射器毎の調整において自由度が９の比較的手のかかる手段によってのみこれを低減することが可能である。

【００１９】複数の投射器において投射特性を一致させることにおける困難は、複数の同様なレーザ光源のレーザ光束の光線パラメータ間における差に主としてよるものである。これらのパラメータは基本的には、光束径、発散、偏光状態、及びモード構造である。この場合においても、複数の画像が同じに見える状態を維持するうえで充分な程度にこれらのパラメータを異なるレーザ光源について一致させるには更なる労力を必要とする。別の問題点として、各レーザ光源の動作安定性を長時間にわたって維持しなければならない点がある。

【００２０】トラック、ヘリコプタ、航空機や船舶のシミュレータにおいては、水平方向の画像角度を現実の状況において実際に見えるようにシミュレートするため円筒または球状面に画像は投射される。現実の画像の印象

8

を得るために必要とされる大きな視角のため、この場合の画像は、異なる投射装置からの複数の画像により構成される。

【００２１】米国特許第４，２９７，７２３号には投射器を用いて上述の要領で画像を映すための構成が開示されている。赤、緑、青の３つのレーザ光束が左側画像、右側画像、及び中央画像に対して別々に強度変調される。強度変調された各画像の赤、緑、青の光は色ミラーによって空間的に合成される。それぞれが各画像の画像情報を含む３本の平行光束が形成される。これらの光束は２軸走査システムにより共に２次元に偏向される。次に３つの光束は３つの画像が全体の画像を形成するように特別に構成された投射光学要素によって湾曲した投射面に向けて偏向される。中央画像は走査システムによって与えられる方向に投射される。右側画像及び左側画像は偏向ミラーによって中央画像から空間的に分離される。全体の画像が許容可能な程度に継ぎ目がなくなるように構成されるためにはこれらのミラーは主投射光線の軸に対して正確に調整されなければならない。画像を分割するために必要とされる偏向ミラーのために投射角は５０°を大きく上回ってはならない。

【００２２】技術的な理由から、１つのみの投射装置が用いられる多くの場合、例えば２００°の水平視角について画像投射を行うことは困難である。それぞれが個別の画像を投射する２個（例：欧州特許第ＥＰ０２１００８８Ｂ１号）、３個、４個、また時としてこれよりも多い投射チャンネル（例：欧州特許出願公開公報第ＥＰ０５２２２０４Ａ１号、米国特許第５，４２４，７７１号）が用いられ、各画像が接合されて全体の画像を形成する。この目的のため、従来技術では投射チャンネルによって必要とされるだけの数の投射器及び光源を用いる。投射器は画像投射により求められるように画像が一緒に配置されるように構成される。

【００２３】欧州特許出願公開公報第ＥＰ０５２２２０４Ａ１号に基づけば、投射ドームの中央に６個のプロジェクタが配置される。この場合、図３１によれば、６個もしくはそれ以上の独立に動作するＲＧＢレーザ光源が使用され、ＲＧＢレーザ光源はそれぞれ独立に動作する原色のレーザ光源を有する。それぞれが独立したレーザの電源及び制御部を有する複数の投射器が用いられる。

【００２４】以上の説明から推察されるように現時点における開発の段階に基づけば、非常に大きな画像、特にドームの全面にわたった投射を行うためには複数の投射装置を使用することが必要である。しかし、この種の装置では、特に独立した光源を有する投射システムの設置及び維持のためにコストが不必要に大きくなる。

【００２５】したがって、本発明は、それぞれが輝度、コントラスト、色再現の特性に関して同じであり、かつ動作時においてこれらの特性に関してそれぞれが同じに維持される複数の画像を投射するためのビデオ投射シス

テムを与える問題を解決するものである。

【００２６】

【課題を解決するための手段】上記課題を解決するために本発明は、複数の画像を投射するためのビデオ投射システムであって、少なくとも１本の光束を発生する光源と、ビデオ信号によって制御される強度変調手段及び空間的光束変調手段と、所定数の個々の画像を表示するための少なくとも１つの投射面とが光路に沿って配置されるビデオ投射システムを提供する。本発明に基づけば、ビデオ投射システムは個々の画像の数に対応する所定数の投射器であって、それぞれが空間的光束変調のための手段を有する投射器を備え、これらの手段は光源に対して光学的に接続される。更に、投射器の数に対応する所定数の部分光束に光束を分割するための手段が光路に沿って光源の後に配置され、部分光束のそれぞれは部分光路を有し、それぞれの部分光路に続いて強度変調のための手段が配置され、強度変調のための手段と空間的光束変調のための手段とは部分光路の１つに沿って配置されるとともにビデオソースの信号によって制御される。

【００２７】本発明の利点の一つは、複数の投射器が空間的配置、投射方向、または投射面に関して分離されているものの、１個の主光源から受光する点である。投射装置の種類に応じて複数の投射器のための少なくとも１つのビデオ信号が生成され、強度変調のための手段または空間光束変調のための手段に供給される。これらの手段の数は投射器の数に対応している。

【００２８】１個のビデオソースとは、画像生成のために１個のみのソースが用いられていることを意味するものではなく、投射器の数に対応した所定数の異なるビデオソースを使用することが可能であることを意味する。すなわち、各投射器に１個のビデオソースを関連付けることが可能である。ソースは例としてテレビ発振器やビデオレコーダを用いることが可能である。

【００２９】更に、全体画像のビデオ情報を投射器の数に対応した個々の画像に対する所定数のビデオ情報単位に分割することが可能であり、各投射器はこのビデオ情報によってそれぞれ制御される。この場合、投射器は全体画像が個々の画像から構成されるような向きで配置することが可能である。ここで個々の画像に対する投射器の再現特性はほぼ同じとなる。光源による輝度、コントラスト、または色における相違はなくなる。

【００３０】本発明に基づく投射システムの使用に関して幾つかの基本的な可能性が考えられる。すなわち、

１．投射器のそれぞれは同じ画像または異なる画像を映すことが可能であり、この場合、投射器は異なる位置に配置され、各投射器は対応する投射面に個々の画像を投射する。この構成は異なる画像内容を有し得る複数の画像が異なる位置に映される場合に１個だけの光源が必要とされるだけであるために特に経済的である。したがって、必要な光出力を得るためのコストは、特にレーザ光源が用いられる場合に大幅に低減される。２．更に、投射器のそれぞれは大きな全体画像の一部をなす個々の画像を形成することが可能である。大きな全体画像は投射器が投射面に対して適当な向きで配置されている場合に個々の投射面上の個々の画像によって構成される。この場合の主たる利点は、輝度、コントラスト、及び色効果の特性が同じである投射器によって個々の画像が形成される点である。３．投射器のそれぞれを１つの投射面上において異なる個々の画像を重ね合わせることが可能な向きで個々の投射面上に配置する。したがって、例として、原色の画像を与える３個の単色投射器によってカラー画像を形成することが可能である。また、偏光法やカラー法を用いて立体視画像を形成することが可能である。

【００３１】光束を分割するための手段は、半透鏡、色ミラー、スプリッタキューブ、回折格子、または偏光子を組み合わせて構成することが可能である。これらの手段は光源からの光束を、異なる光路を辿るとともに強度、位相位置、偏光方向または波長に基づいて分けられる異なる部分光束に分割する特性を有さなければならない。これらの手段の幾つかを実施例においてより詳細に説明するが、当業者であれば最も小型の構成を非常に経済的に実現する、光束を分割するための他の構成及び組み合わせは自明であろう。一般に、更なる偏光ミラーを用いて扱いが容易であるとともに空間的な場所を取らない光路を得ることが可能である。

【００３２】光束を分割するための手段は光源からの光束を強度変調手段に対して所定の比に分割するうえで機能する。画像を同じ特性にて映すため、全部分光束に対する分割比は投射器の数と同じになるように選択される。輝度または色印象の異なる画像を形成するような場合には異なる分割比を定義することも可能である。

【００３３】分割は、例として半透鏡や色ミラーにより、時間的に変化しないように決定される。例としてレーザオプティック社（Ｌａｓｅｒｏｐｔｉｋ　ＧｍｂＨ，Ｇａｒｂｓｅｎ）製Ｄ－３０８２６などの光束を分割するための制御装置及び調整手段により、画像を映す一方で分割比の調整や変更を行うことが可能である。しかし、分割比が一旦設定されると、調整輝度及び調整色印象は恒久的なものとなる。

【００３４】強度変調のための手段は、上述の項目１に述べた画像イメージング投射器においては空間光束変調のための手段と同じである。これらの手段は全ての投射器の内部目標面を形成し、個々の画像を形成する。これらの手段はＬＣＤマトリクス、ＤＭＤアレイまたは受動的に光を放射する他の光源により実現される。

【００３５】それ自体では光を放射しない画像ソースとしては拡大光束の強度分布にその断面において影響を与える全ての手段が含まれる。例として、陽画のスライド、ダイアフラムまたはシャッタ、光弁などが含まれる

が、ダイオード、トランジスタ、ミニチュア電子管などの能動的に光を発生するマトリクスは含まれない。

【００３６】個々の画像は例としてＬＣＤマトリクスにおいて直接見ることが可能である。しかし、大きな画像を得るためには投射器の内部目標面において形成される個々の画像は投射対物レンズによって投射面上において拡大される。

【００３７】投射器の数に対応した所定数の拡大要素が各部分光束に対して部分光路の分割手段に続いて配置されるのは画像イメージング投射器内においてのみ、かつ部分光束の径が装置内部の目標面の大きさよりも小さい場合においてのみであり、各拡大要素は各投射器の内部目標面の大きさにまで部分光束を拡大する。対応する内部目標面の大きさまでの部分光束の拡大により、他の投射器における他の部分光束と同様の特性を有する部分光束によって内部目標面を照射することが可能となる。

【００３８】上述の項目２に述べたレーザ投射器においては、空間光束変調手段は、対応する部分光束を２次元に偏向する２軸動作偏向システムを含む。この書き込まれた部分光束により投射面上に、観測者にフレームまたは画像として認識される線が緊密な列として形成される。

【００３９】詳細には、２軸偏向システムはライン偏向のためのポリゴンミラーと画像またはフレーム走査のための傾動ミラーとの組み合わせである。２軸偏向システムは上述の手段を２重に配置することで有利に実現することが可能である。しかし、２軸動作偏向システムは国際特許出願公開公報第ＷＯ９６／２５００９号に述べられる制御可能な手段から構成することも可能である。この場合、光束はその放射方向にのみ変調されることが重要である。

【００４０】書き込み光束にて動作する投射器においては、強度変調のための手段は詳細には電気光学的または音響光学的変調器である。これらの変調器は比較的簡単な電気制御により輝度変調された部分光束を生じる。

【００４１】更に、光の強度変調または振幅変調は国際特許出願公開公報第ＷＯ９６／２５００９号に述べられる原理の１つに基づいて実施することも可能である。本発明においては２種類の光源が用いられる。

【００４２】第１の種類の光源は、空間的に拡大された光強度分布曲線を有する放射源である。これらの放射源はハロゲンランプなどの温度放射体または発光ダイオードなどの光放射体として実現される。

【００４３】第２の種類の光源は、事実上平行な光束を生じる放射源である。現在の技術に基づけばこの放射源はレーザ光源である。ビデオ投射システムにおいて特に好適なレーザ光源は光束の発散が回折により制限される特性を有する。

【００４４】本発明に基づくビデオ投射システムはカラー画像を映すうえでも特に好適である。この種のビデオ投射システムは赤、緑、青の原色を含む光束の光路が光源に続くことを第１の特徴とする。分割手段はこの光路上に配置され、投射器の数に対応した所定数の部分光束に光束を分割し、これらの部分光束のそれぞれを更に３本の部分光束に分割する。部分光束のそれぞれは赤、緑、青の原色の内の１色を含むとともに部分光路を有し、各部分光路上には強度変調手段が配置される。更に赤、緑、青の原色の１色である部分光束の内の１つが案内される３つの部分光路のそれぞれは投射器の１つに割り当てられ、これらの３つの部分光路上に置かれた強度変調手段はビデオソースからのカラービデオ信号によって制御される。

【００４５】カラー画像を映すためのビデオ投射システムは、赤、緑、青の原色の光束に対する空間的に懸隔した光路が光源に続くとともに３つの光束を分割するための手段がこれら３つの光路上に配置されることを第２の特徴とする。これらの手段は３本の光束のそれぞれを投射器の数に対応した所定数の部分光束に分割する。ここで各部分光束は部分光路を有し、各部分光路上には強度変調手段が配置される。更に、赤、緑、青の原色の内の１色である部分光束の１つが案内される３つの部分光路のそれぞれは投射器の１つに割り当てられ、これらの３つの部分光路上に置かれた強度変調手段はビデオソースからのカラービデオ信号によって制御される。

【００４６】後者の場合、光源はこれから赤、緑、青の色成分が別々の光路に分離される放射源であるか、あるいは光源はそれぞれが赤、緑、青の内の１つを独立した光路に生じる３個の放射源にて構成される。

【００４７】できるだけ均一かつ永続的な画像再生特性を得るため、本発明の範囲においてＲＧＢレーザ光源である光源の使用が特に有利である。温度放射体は連続スペクトルを与えるが、この連続スペクトルからは３原色のスペクトル領域が取り出されるだけでよい。温度放射体の動作には主として熱による大きなエネルギー損失を常に伴う。しかし、ＲＧＢレーザ光源は数ナノメートルの波長領域の３つの光成分のみを与える。このレーザ光の波長はレーザ物質の特性に基づいたものであり、時間的にほぼ一定に維持することが可能である。

【００４８】３原色のそれぞれに対する出力の割合は電子制御装置によって非常に安定的に調整することが可能である。例として、昼間に相当する標準照度Ｄ６５に対する投射器の光源のホワイトバランスは、赤１００％（６３２ｎｍ）、緑９５．３％（５３２ｎｍ）、青６７．９％（４４５ｎｍ）の出力比率を必要とする。

【００４９】拡大要素が原色のそれぞれの部分光束の部分光路上に分割手段に続いて配置されるのは、上述の項目１に述べた画像イメージング投射器内においてのみ、また部分光束の径が装置内部の目標面の大きさよりも小さい場合においてのみであり、各拡大要素が対応する投射器の内部目標面の大きさにまで原色の部分光束の１つ

を拡大する。

【００５０】カラー画像を映すためのビデオ投射システムの上記２つの変形例において、有利な構成は、投射器及び個々のカラー画像に関連付けられた３本の部分光束が重ね合わせ手段に割り当てられ、各カラー画像を映すための空間的に合成された部分光束が投射面上に投射される点である。

【００５１】ここで、投射面上における部分光束の「重ね合わせ」とは、部分光束が直接投射面上で重ね合わされなければならないということを意味するものではなく、部分光束は強度変調手段と投射面との間の領域において重ね合わされることが可能であるということを意味するものである。この重ね合わせの結果、重ね合わせの位置とは関係なく異なる色の部分光束から合成カラー画像が投射面上において形成される点は重要である。３つの部分光路上の異なる色の部分光束は次の３つの方法により重ね合わされて個々のカラー画像を形成する。すなわち、１）それ自体が個々の画像の投射面に向けられた画像再生のための３つの投射チャンネルを備えるカラー画像投射器により個々の画像について原色の３つの異なる色の部分光束を直接この投射面上で重ね合わせる。２）空間的光束変調手段と投射面との間の光路上で個々の画像について原色の３つの異なる色の画像を重ね合わせる。３）強度変調手段と空間的光束変調手段との間の光路上で個々の画像について原色の３つの異なる色の部分光束を重ね合わせる。

【００５２】更に、色成分の数は３原色に限定されない。３原色を用いることにより３原色によって作られる色度図における他の全ての色刺激値が得られるためこの構成は特に有利なものの１つに過ぎない。本発明は３原色以外の２色、または３色を用いて実現することが可能である。この場合、高品質の画像が形成されないか、３色よりも多い色が用いられた場合にはコストが増大する。

【００５３】原色の３つの画像を重ね合わせて個々のカラー画像を形成するための手段が、３つの部分光路において、原色の個々の画像を形成するとともに個々のカラー画像に対する投射器の内の１つに関連付けられた装置内部の目標面の後に配置されるのは、上記の項目１に述べられた画像イメージング投射器においてのみである。

【００５４】これに対し、上記の項目２に述べられたレーザ投射器においては、重ね合わせ手段が３つの部分光路上において投射器の１つに関連付けられた３つの強度変調手段の後に配置される点が特に有利である。重ね合わせ手段は原色の３本の部分光束を共通の光路に合成し、この後に空間光束変調手段が配置される。

【００５５】この場合、空間的光束変調手段の手前において空間的統合が行われ、投射面上においてコンバージェンスの問題が生じないため、原色の３本の光束を重ね合わせるうえで問題は生じない。しかし、上述の異なる色の光束の重ね合わせの内の１つを、レーザ投射器において、投射面上または空間的光束変調手段の後にて異なる色の画像を重ね合わせることにより行うことも可能である。

【００５６】上述の項目２において述べたレーザ投射器においては、空間的光束変調手段は画像サイズを調整するために偏向角を減少または増大させる変換光学要素を含むことが望ましい。

【００５７】更に、ビデオ投射装置は、赤、緑、青の原色の部分光束を時間的に順番に発生する光源を備えることが可能である。この部分光束の時間的連続的発生は分割手段によって行うことも可能である。これにより個々のカラー画像を映すための時間重複動作モードが得られ、強度変調手段及び空間的変調手段はビデオ信号に基づいて制御される。これらのビデオ信号は時間重複動作に対応して生成される。この種の画像形成は、各色チャンネルの調整にかかるコストがこうした場合では小さいため、画像イメージング投射器において特に有利である。更に、この時間重複動作モードは構成要素を約３分の２減らすことが可能であるという一般的な利点を有する。

【００５８】多くの用途において、光源を投射器から離して配置するか、投射器同士を空間的にやや離して設置するかして空間的に柔軟に配置することが必要であるかまたは推奨される。このため各部分光路上の光束分割手段と空間的光束変調手段との間の部分において光ファイバ接続が設けられる。各部分光束は１以上の光ファイバにできるだけ完全に結合されることが重要である。

【００５９】書き込みレーザ光束を用いたレーザ投射器では、光ファイバ接続は部分光路上の強度変調手段と空間的光束変調手段との間に特に好ましく設けられる。また、光ファイバ接続は分割手段と強度変調手段との間に設けることも可能である。

【００６０】上述の項目２に述べたレーザ投射器に基づいてカラー画像を形成するビデオ投射システムでは、重ね合わせ手段と空間的光束変調手段との間に位置する部分光路の少なくとも一部は光ファイバ接続により形成されることが特に有利である。

【００６１】しかし、全ての部分光路が光ファイバ接続を有することは必ずしも必要ではない。光ファイバ接続を他の光学的伝送路と組み合わせることも可能である。更に、３次元画像印象を得るために２個の画像が重ね合わされるビデオ投射システムにおいて本発明を有利に用いることも可能である。特に、レーザ光源が用いられている場合に好適な方法としては、１）偏光方向の異なる個々の画像を投射すること（一般にレーザ光源は偏光した光を与える）、２）わずかに異なる波長を有するが人の眼には同じ色として知覚される個々の画像を投射すること（一般にレーザ光源は帯域幅の小さい光を発生する）の２つがある。

【００６２】第１の方法は、例としてドイツ特許第ＤＥ１９５３７３５６Ｃ１号に開示されているが、ここでは投射器によって形成される、偏光方向が互いに直交した画像が重ね合わされる。この場合においても、１個だけの光源が用いられ、投射面上において２個の画像が同時かつ互いに独立に形成されることが有利である。

【００６３】ここで、光源は少なくとも２つの異なる偏光方向を有する光を発生し、それぞれの偏光は強度変調手段に案内される。この場合、３次元視を可能とするように画像を重ね合わせるソースによって強度変調手段を制御することが可能である。変調された光束は互いに対して調整された個々の投射器により投射面上に投射される。

【００６４】しかし、円偏光した光束を与える光源を用いることによっても異なる偏光方向を得ることが可能である。この場合、光束分割手段により２つの異なる偏光方向が得られる。

【００６５】ドイツ特許第ＤＥ１９５３７３５６Ｃ１号の開示に対し、ここでは異なる偏光の発生及び分割は強度変調手段の手前で行われる。このことは、とりわけ、右眼と左眼とに対して個別の画像が同時に生成されるという利点を有する。ここで、２次元投射において実現されるような画像の解像度を得るために個々の画像のそれぞれに対して１個の投射器が用いられる。

【００６６】第２の方法は、例としてドイツ特許出願公開公報第ＤＥ１９８０８２６４Ａ１号に開示されるが、ここでは、投射器によって形成される、異なる小帯域波長領域を有する画像が重ね合わされる。

【００６７】本発明に基づけば、光源は２つの異なる波長の差が８０ｎｍよりも小さくなるような異なる波長の光束を発生することが可能である。光束分割手段により２つの部分光束が生じ、「３次元視」を可能とするように画像を重ね合わせるソースによって制御することが可能な強度変調手段に案内される。変調された光束は互いに対して調整された個々の投射器により投射面上に投射される。

【００６８】全ての場合において、光源の光束は本発明に基づく構成によって部分光束に分割される。この工程により公知の構成と比較して大幅にコストを低減させることが可能である。

【００６９】電子的ビデオ情報は強度変調手段または空間的光束変調手段によって光学的ビデオ情報に変換され、この情報を用いて空間的に独立して配置された複数の投射器から画像が形成される。ＲＧＢ光束を発生するうえでレーザ光源を用いることにより非常に大きな利点が得られる。レーザ光源の予め設定された波長を光源の寿命の全体にわたって安定に保つことが可能である。これにより投射器の色再生特性を時間的に不変かつ投射器間で同じにすることが可能である。偏向ミラー、半透鏡、色ミラーなどの、用いられる光学要素の全ては光学的に受動的な要素であり、その機能は出力に依存せず、また時間の経過につれて変化することもない。

【００７０】２以上の投射器を用いたビデオ投射システムはより簡単に構成することが可能である。こうしたビデオ投射システムの使用及び保守に伴うコストを本発明に基づいたシステムにより大幅に低減させることも可能である。

【００７１】

【発明の実施の形態】本発明を図１乃至図７に基づき以下に詳細に説明する。図１は３個の画像を投射するためのビデオ投射システムを示したものであり、書き込み光束によって画像Ａ、Ｂ及びＣが形成されている。光学信号を搬送する部分光束２’，３’，４’は、強度変調することが可能な複式光源１０１と３個の投射器１１５，１１６及び１１７との間で光ファイバ接続４５，４６及び４７により伝送される。３個の投射器１１５，１１６及び１１７はそれぞれ投射面５５，５６及び５７に対して向けられている。

【００７２】更に、強度変調することが可能な複式光源１０１、投射器１１５，１１６及び１１７と、それぞれに対応した、ビデオチャンネルＣ用の電子制御ユニット１０５、ビデオチャンネルＢ用の電子制御ユニット１０６、及びビデオチャンネルＡ用の電子制御ユニット１０７とは電気的に接続されている。

【００７３】本実施形態においては３個の画像は、方向、位置、サイズ、及び画像内容に関して互いに独立に投射することが可能である。投射器１１５，１１６及び１１７、及び各投射器に割り当てられた投射面５５，５６及び５７の設置位置は互いに対して比較的独立に選択することが可能である。３個の投射器１１５，１１６及び１１７の間には６０メートルの距離をとることが容易に可能である。強度損失につながる、現時点で利用可能な光ファイバの光学的減衰のため、強度変調することが可能な複式光源１０１から投射器１１５，１１６及び１１７までの最大距離は３０メートルを大きく上回ってはならない。

【００７４】図１に基づく実施例に示された強度変調することが可能な複式光源１０１は、光源１００、光束１を３本の部分光束に分割するための手段１１１、及び３つの強度変調手段２５，２６及び２７から構成される。光源１００から射出する光束１は光束を同じ強度の３本の部分光束２，３及び４に分割するための手段１１１によって分割される。したがって、部分光束２，３及び４のそれぞれは光束１の１／３の強度を有する。部分光束２，３及び４は投射面５５，５６及び５７上に個々の画像Ａ，Ｂ及びＣを形成する。

【００７５】本実施例においては、光源１００は波長５３２ｎｍの単色レーザ光源である。本実施例において、光束１を３本の部分光束に分割する手段１１１は、半透鏡である３３％スプリッタミラー６１及び５０％スプリ

ッタミラー６２から構成される。スプリッタミラー６１とスプリッタミラー６２とは光束１の光路上で互いに前後に配置される。この場合、部分光束２，３は偏向ミラー６５によって９０°偏向される。部分光束２，３及び４のそれぞれには強度変調のための手段２５，２６及び２７がそれぞれ関連付けられている。本実施例においては、強度変調手段は音響光学変調器である。互いに独立に動作する３つの強度変調手段２５，２６及び２７のそれぞれは電子制御ユニット１０５，１０６及び１０７の内の１つから電気信号を受ける。これらの電気信号は投射面５５，５６及び５７上に表示される個々の画像の画像情報に対応している。強度変調のための電気信号はビデオ信号Ａ，Ｂ及びＣから得られる。

【００７６】例として、ドイツ特許第ＤＥ１９５３７３５６Ｃ１号にはビデオデータの処理法及び変調器の制御法について述べられている。光の進行方向で考えると、光ファイバ接続４５，４６及び４７の光入力側の端部は光路上で強度変調手段２５，２６及び２７の後に配置される。変調された部分光束２'，３'及び４'はそれぞれ光入力側の端部に入力される。本実施例においては、各光ファイバ接続４５，４６及び４７は、光入力端部のカップリングーイン光学素子、多重モード光ファイバ、及び光ファイバの光出力端部のカップリングーアウト光学素子から構成される。例として、ドイツ特許出願公開公報第ＤＥ１９６１６８４３Ａ１号にはビデオ投射システムにおいてこの種の光ファイバ接続がどのように構成されるかに関して述べられている。

【００７７】光ファイバ接続４５，４６及び４７の各光出力端部は投射器１１５，１１６及び１１７の１つに接続されている。本実施例においては、投射器１１５，１１６及び１１７はそれぞれ空間的光束変調のための手段３５，３６及び３７を備える。光ファイバ接続４５，４６及び４７から出る部分光束はそれぞれ空間的光束変調手段３５，３６及び３７に入射する。本実施例における空間的光束変調手段はライン偏向のための回転式ポリゴンミラー及びフレーム偏向のための傾動ミラーにて構成される。この種の構成はドイツ特許第ＤＥ４３２４８４９Ｃ２号に述べられているが、光束の偏向角を増大させるための変換光学要素は２個の偏向ミラーの後に配置される。変換光学要素が必要とされる場合、各空間的光束変調手段の一部を変換光学要素にて構成することも可能である。ライン方向及びフレーム方向に偏向される部分光束１５，１６及び１７のそれぞれにより個々の画像Ａ，Ｂ及びＣが形成される。

【００７８】図２は、ＬＣＤマトリクスにより形成される３個の画像、Ａ，Ｂ及びＣを投射するためのビデオ投射システムを示したものである。ＬＣＤマトリクスを用いて動作する投射器は画像イメージング投射器の範疇に含まれるものである。本実施例においても光源２００としてレーザ光源が用いられ、光学チャンネルにおいて光ファイバ接続４５，４６及び４７が用いられている。この場合におけるビデオ投射システムは、３本の部分光束２，３及び４を発生する複式光源２０１（強度変調することができない）と３個の投射器２１５，２１６及び２１７とを含む。各投射器は投射面５５，５６及び５７の内の１つに向けられている。複式光源２０１と投射器２１５，２１６及び２１７との間の光学的接続は、３つの光ファイバ接続４５，４６及び４７により得られる。この構成により３個の画像は、方向、位置、サイズ、及び画像内容に関して互いに独立に投射することが可能である。

【００７９】ここで投射器２１５，２１６及び２１７、及び各投射器に割り当てられた投射面５５，５６及び５７の設置位置は図１に参照して述べられたように互いに対して比較的独立に選択することが可能である。

【００８０】図２に基づいた実施例では、複式光源２０１は１個の光源２００と光束を３本の部分光束に分割するための手段２１１とを有する。光源２００から出る光束１は分割手段により強度の等しい３本の部分光束２，３及び４に分割される。すなわち部分光束２，３及び４のそれぞれは光束１の１／３の強度を有する。本実施例においては、光源２００は波長５３２ｎｍのレーザ光源である。光束１を分割するための手段は３３％スプリッタミラー６１及び５０％スプリッタミラー６２を含む。スプリッタミラー６１とスプリッタミラー６２とは光束１の光路上で互いに前後に配置される。この場合、部分光束２，３及び４は偏向ミラー６５及びカップリングーイン光学素子により光ファイバ接続の光入力端部の１つに入射する。

【００８１】本実施例においては、光ファイバ接続４５，４６及び４７の各光出力端部は投射器２１５，２１６及び２１７の１つに接続される。この場合、各投射器２１５，２１６及び２１７は、部分光束２，３及び４を拡大するための光学要素２２５，２２６及び２２７、強度変調手段２５，２６及び２７、空間的光束変調手段３５，３６及び３７、及び、投射光学要素８５，８６及び８７を有する。この場合、部分光束１５，１６及び１７は個々の画像のフルサイズの画像情報を常に含む。

【００８２】本実施例においては、強度変調手段２５，２６及び２７は対応する空間的光束変調手段３５，３６及び３７に一致した同一のものである。これらの手段は本実施例においてはＬＣＤマトリクスにより実現されている。各ＬＣＤマトリクスは投射光学要素８５，８６及び８７の目標側の焦点の手前に配置される。ＬＣＤマトリクスは、装置内部の目標面であって、投射光学要素８５，８６及び８７により投射面５５，５６及び５７上に投射される目標面において全体の画像が映されるように電子制御部１０５によって制御される。本実施例においてはビデオ信号Ａを処理する電子制御ユニット１０５が１個のみ設けられる。したがって投射面５５，５６及び

５７には同じ画像が投射される。例として各画像は異なる空間に映される。

【００８３】部分光束を拡大するための光学要素２２５，２２６及び２２７は、ＬＣＤマトリクスの画像領域ができるだけ均一かつ完全に照射されるまで光ファイバから射出する部分光束を拡大するうえで必要とされる。拡大されたレーザ光束を用いる画像イメージング投射システムは例として欧州特許出願公開公報第ＥＰ０５８９１７９号に開示されている。この場合、強度変調手段及び空間的光束変調手段としてＤＭＤアレイが用いられる。

【００８４】図３は、強度変調可能な複式光源３０１を備えた、４個のカラー画像Ａ，Ｂ，Ｃ及びＤを投射するためのビデオ投射システムの光学的構成を示したものである。

【００８５】光源３００は赤ー緑ー青光束１（ＲＧＢ光束）を発生する。この実施例においては光束はＲＧＢレーザ光束である。光束１は第１の半透鏡６２に入射する。第１の半透鏡６２はそれぞれ入射ＲＧＢ光束１の５０％の強度を有する２本の部分光束２，３に光束１を分割する。それぞれＲＧＢ光束１の２５％のＲＧＢ強度を有する部分光束４，６を形成する第２の半透鏡６２が部分光束２の光路上に配置される。以下、ビデオチャンネルＤにおける画像表示のための光学要素についてのみ光路を説明する。偏向ミラー６５により５０％部分光束３は９０°偏向される。この後、部分光束３は更なる半透鏡６２に入射する。それぞれがＲＧＢ光束１の２５％の強度を有する部分光束５及び７が形成される。２５％部分光束７は第１の色ミラー６３に入射する。第１の色ミラー６３は部分光束７の赤色部分光束８は反射し、緑色及び青色部分光束９は透過する。緑色及び青色部分光束９は第２の色ミラー６４に入射する。第２の色ミラー６４は、緑色部分光束１０は反射し、青色部分光束１１は強度変調手段２５に向けて透過する。光路上の更なる偏向ミラー６５により緑色部分光束１０及び赤色部分光束８は強度変調手段２５に向けて偏向される。本実施例では、強度変調手段２５はそれぞれが各原色に対応した３つの独立した強度変調器を有する。

【００８６】ここに述べたビデオチャンネルＤの光束の分割はビデオチャンネルＡ，Ｂ及びＣについても同様である。光束１を分割するうえで機能する半透鏡６２、偏向ミラー６５、及び色ミラー６３，６４は、ＲＧＢ光束１を４本の部分光束に分割するための手段３１１を構成する。

【００８７】赤色部分光束８、緑色部分光束１０及び青色部分光束１１が強度変調手段２５Ｒ，２５Ｇ及び２５Ｂにそれぞれ入射し、強度変調手段２５Ｒは赤色変調信号により、強度変調手段２５Ｇは緑色変調信号により、強度変調手段２５Ｂは青色変調信号により制御することが可能である。

【００８８】ビデオチャンネルＡ，Ｂ及びＣにおける強度変調手段も同様に構成される。原色の３つの部分光路上の強度変調手段２５の後に重ね合わせ手段６５が配置される。強度変調された赤色部分光束８'の部分光路上には偏向ミラー６５が配置される。部分光路上の偏向ミラー６５の後には色ミラー６４が置かれ、強度変調された赤色部分光束８'は透過するが強度変調された緑色部分光束１０'は反射する。強度変調された赤及び緑色部分光束９'の部分光路上に置かれた色ミラー６３は、強度変調された赤および緑色部分光束９'は反射するが、強度変調された青色部分光束１１'は透過する。色ミラー６３の後において、輝度が共線化されるとともに色変調されたＲＧＢ部分光束７'が得られる。ＲＧＢ部分光束７'はカラービデオ信号Ｄに含まれる情報に対応した輝度及び色効果を有する。光成分の強度変調（強度変調手段２６，２７及び２８による）及び共線輝度変調かつ色変調された部分光束２'，３'及び６'を生ずる合成（重ね合わせ手段７６，７７及び７８による）は各ビデオチャンネルＡ，Ｂ及びＣについて同様に行われる。ビデオチャンネルＤの部分光束８'，９'，１０'及び１１'の空間的重ね合わせを行ううえで機能する偏向ミラー６５と色ミラー６３，６４とは３重の重ね合わせ手段７５を構成する。ビデオチャンネルＤ，Ｃ，Ｂ及びＡについて３重の重ね合わせを行う手段は、４個の投射器において変調された原色の部分光束を重ね合わせるための要素群３１２を構成する。

【００８９】分割手段３１１、強度変調手段２５，２６，２７及び２８、及び重ね合わせ要素群３１２の内の少なくとも１つは４つの３重の重ね合わせ手段７５，７６，７７及び７８を有するキャリア上に配置される点は重要である。この構成は従来の光学要素、または新たな集積光学系及び微小光学要素により実施することが可能である。ドイツ特許出願公開公報第ＤＥ１９５０３９２９Ａ１号には集積光学系及び微小光学要素を用いた多くの例について述べられている。

【００９０】ビデオ信号Ｄ，Ｃ，ＢまたはＡに対応した更なる処理を行うための、輝度及び色情報が変調された４つのＲＧＢ部分光束２'，３'，６'及び７'が、重ね合わせのための要素群３１２の出力側において形成される。このためには全ての光束は１個の光源３００によって発生させられなければならない。ＲＧＢ部分光束２'，３'，６'及び７'は色消しレンズにより光ファイバに導入される。各光ファイバは強度変調可能な複式光源３０１と４個の投射器３１５，３１６，３１７及び３１８との間に光ファイバ接続を形成する。

【００９１】投射器３１５，３１６，３１７及び３１８はそれぞれ空間的光束変調のための手段３５，３６，３７及び３８を有する。本実施例においては、空間的光束変調のための手段３５，３６，３７及び３８はポリゴンミラーと傾動ミラーとからなる２軸偏向システムであ

る。光ファイバから射出する輝度変調かつ色変調された光束は光束変形光学要素によりライン偏向のためのポリゴンミラー、更にフレーム偏向のための傾動ミラーに進む。これらの要素群は図３に概略的に示されている。ポリゴンミラー及び傾動ミラーは対応する制御装置１０５，１０６，１０７及び１０８に電気的にそれぞれ接続されている。入力ビデオ信号であるビデオ信号Ａ、ビデオ信号Ｂ、ビデオ信号Ｃ及びビデオ信号Ｄの処理がどのように行われるかについては図７に基づいて後述する。

【００９２】図４は、図３に示される原理と同様の２以上の画像を投射するためのビデオ投射システムを示したものである。この実施例では強度変調可能な複式光源４０１は３個のレーザ光源４０５，４０６及び４０７と、各光束を赤、緑、青の原色に４方向分割するための手段４１１とを含む。この構成は、レーザ光源４０５が赤色用に、レーザ光源４０６が緑色用に、レーザ光源４０７が青色用に設けられている点で図３の構成と異なる。この場合、３原色は別々の光路を辿ることになる。したがって光束を原色に分離するための色ミラーは必要ではない。本実施例においては光束は図３と同様、５０％半透鏡６２と偏向ミラー６５とにより強度に基づいて分割される。

【００９３】この場合では１７個のミラーが用いられている。図３に基づく構成では２２個のミラーを用いているが、３原色を分離しなければならないためにコストがより大きくなる場合がある。

【００９４】図３の実施形態と全く同様に、ビデオ投射システムは光の進行方向に見て分割手段４１１の後に配置される。図５は、２以上の画像を投射するためのビデオ投射システムを示したものであるが、３原色が時間的に順番に強度変調手段２５，２６，２７及び２８に送られる。レーザ光源５００は強度変調することが可能な複式光源５０１の放射源であり、時間的に連続して赤、緑、青の光成分を発生する。強度変調手段２５，２６，２７及び２８は現時点でのビデオ信号Ａ，Ｂ，Ｃ及びＤと、ＲＧＢ部分光束を偏向するための手段３５，３６，３７及び３８から得られる同期信号とに応じて時間重複動作にて制御される。

【００９５】この場合、光束を４方向分割するための手段５１１は３個の半透鏡６２と３個の偏向ミラー６５とを有するだけである。この他の参照符合は図３におけるものと同じ構成要素を示している。

【００９６】本発明の特徴によりまた、３次元画像印象を与える画像を投射するためのビデオ投射システムを構築することが可能となる。同様な構成は例として、欧州特許出願公開公報第ＥＰ０４７３３４３Ａ１号に開示されているがこの構成では１個のみの投射器が用いられている。図６は、例として２個の投射器３１６，３１７を備えた単色立体視画像表示のためのビデオ投射システムを示したものであり、垂直方向の偏光方向を有する光が形成する画像Ｅと水平方向の偏光方向を有する光が形成する画像Ｆとが投射面５９上で重ね合わされる。３次元視を行うためには観測者は１つの画像の光成分を観測者の眼の一方に取り出す偏光フィルタを備えた眼鏡を着用する。

【００９７】この場合のビデオ投射システムは波長は単一であるが互いに直交する２つの偏光方向を有する光を発生する光源６００を備える。光源６００と光束１を分割するための手段６１１とは強度変調手段２６，２７とともに強度変調することが可能な複式光源６０１を構成する。ビームスプリッタ６６により垂直方向の偏光成分が水平方向の偏光成分から分離される。光束１の分割比は５０％である。部分光束２及び３の一方が分割手段６１１の後に配置された強度変調手段２６及び２７の一方に入射する。強度変調手段２６及び２７はビデオ信号Ｓに基づいて強度変調手段２６及び２７を制御する電子制御ユニット１０９により制御される。この他の参照符合はその相互作用について図３に基づいて既に述べた構成要素群を示す。図６に基づいたビデオ投射システムと図３または図４に示されたビデオ投射システムとの組み合わせによりカラー画像の３次元表示が可能である。

【００９８】図７は、例として図３または図４に基づいた構成において４個の画像が映される場合に用いられる４チャンネル画像保存部１１０を示したものである。入力側においてビデオソースは、ＲＧＢカラー信号及び同期信号ｓｙｎｃとしての各ビデオ信号Ａ，Ｂ，Ｃ及びＤにより画像保存部１１０の入力セクタ８５，８６，８７及び８８に接続される。出力側においては４倍ＲＧＢカラー信号が出力セクタ９５，９６，９７及び９８から取り出される。出力側の同期は、偏向手段において各ポリゴンミラーの回転位置より得られるファセットクロック信号Ｔａｋｔｒ，ｓ，ｔ及びｕによって行われる。出力セクタ９５，９６，９７及び９８の内の１つは入力セクタ８５，８６，８７及び８８にそれぞれ関連付けられている。入力セクタ８５及び出力セクタ８６は電子制御ユニットの一部である。他のセクタはそれぞれ電子制御ユニット１０６，１０７及び１０８に付属している。

【００９９】

【発明の効果】本発明に基づくビデオ投射システムにより、多チャンネル投射システムの起動動作、連続動作、及び保守に伴う初期コストが大幅に低減される。

【図面の簡単な説明】

【図１】　書き込みレーザ光束により形成される３つの画像を投射するための本発明に基づいたビデオ投射システムを示す概略図。

【図２】　レーザ光源及び光ファイバ接続を有する画像イメージング投射器によって形成される３つの画像を投射するための本発明に基づいたビデオ投射システムを示す概略図。

【図３】　ＲＧＢレーザ光源からの書き込み光束により

４個のカラー画像を投射するための本発明に基づくビデオ投射システムを示す概略図。

【図４】　赤色レーザ光源、緑色レーザ光源、及び青色レーザ光源からの書き込み光束により４個のカラー画像を投射するための本発明に基づくビデオ投射システムを示す概略図。

【図５】　時間重複投射により４個のカラー画像を投射するための本発明のビデオ投射システムを示す概略図。

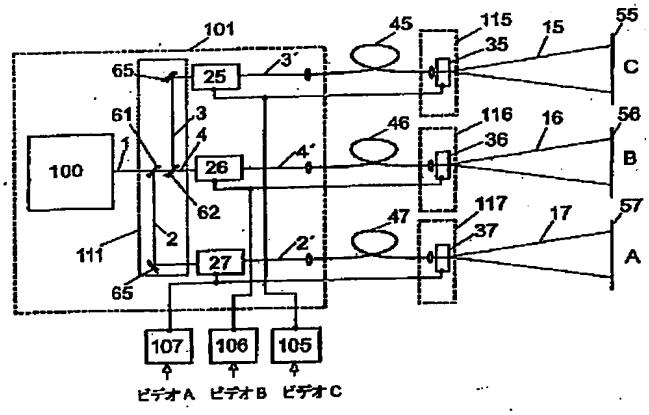
【図６】　３次元画像印象を与える画像を投射するための本発明に基づくビデオ投射システムを示す概略図。

【図７】　２以上の画像を投射するための本発明に基づくビデオ投射システムのための制御装置を示す概略図。

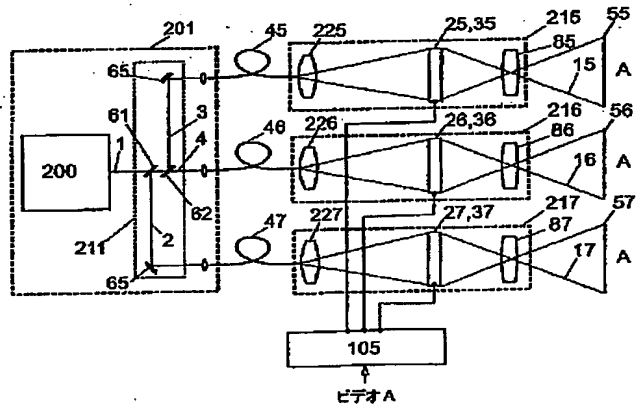
【符号の説明】

１…光束、２，３，４…部分光束、１５，１６，１７…部分光路、２５，２６，２７…強度変調手段、３５，３６，３７…空間的光束変調手段、１００，２００，３００，４００，５００，６００…光源、１０５，１０６，１０７…ビデオソース、１１１，２１１，３１１，４１１，５１１，６１１…光束の分割手段、Ａ，Ｂ，Ｃ…ビデオ信号。

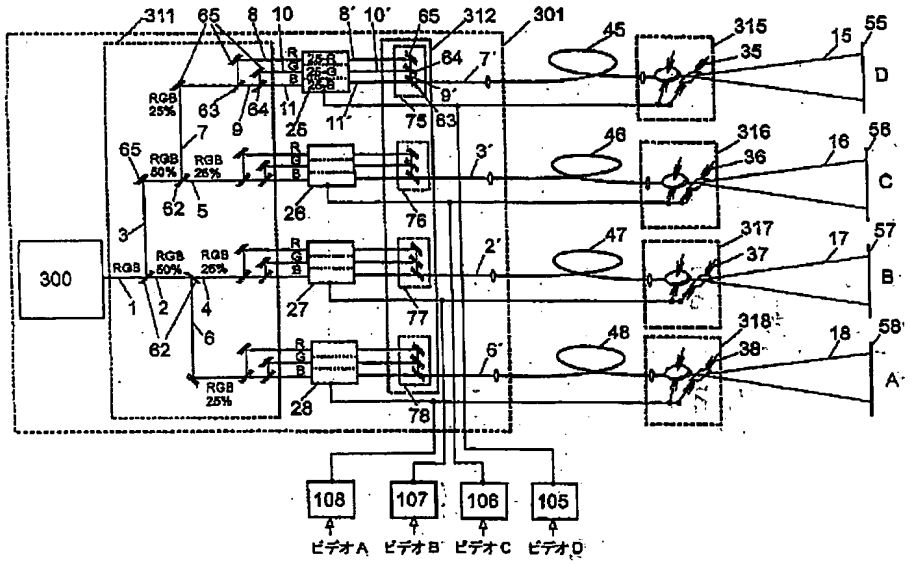
【図１】



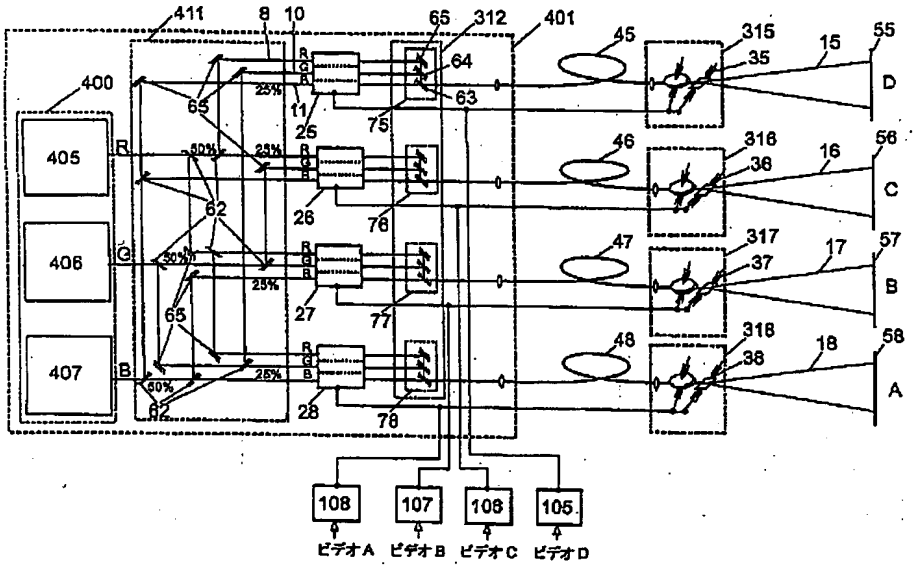
【図２】



【図３】



【図４】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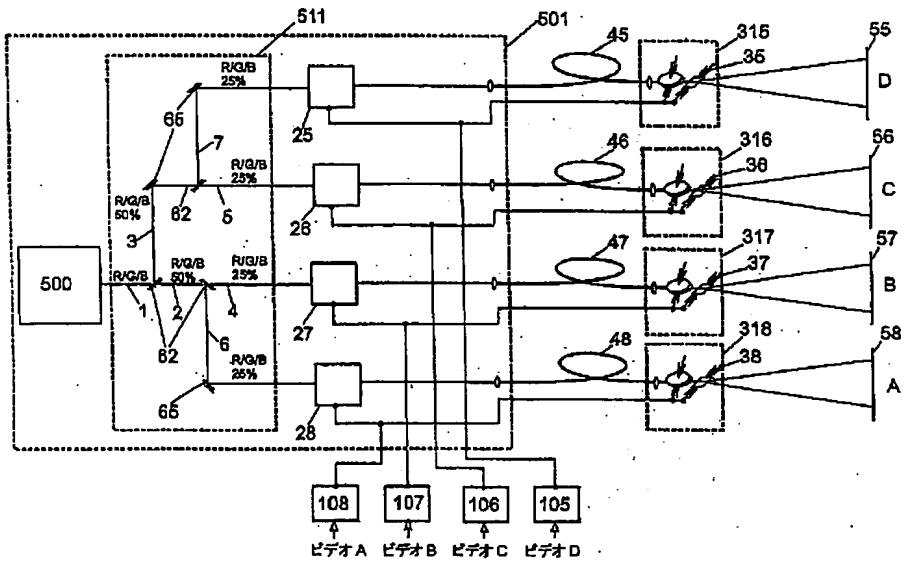
ビデオD

【図５】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ビデオA
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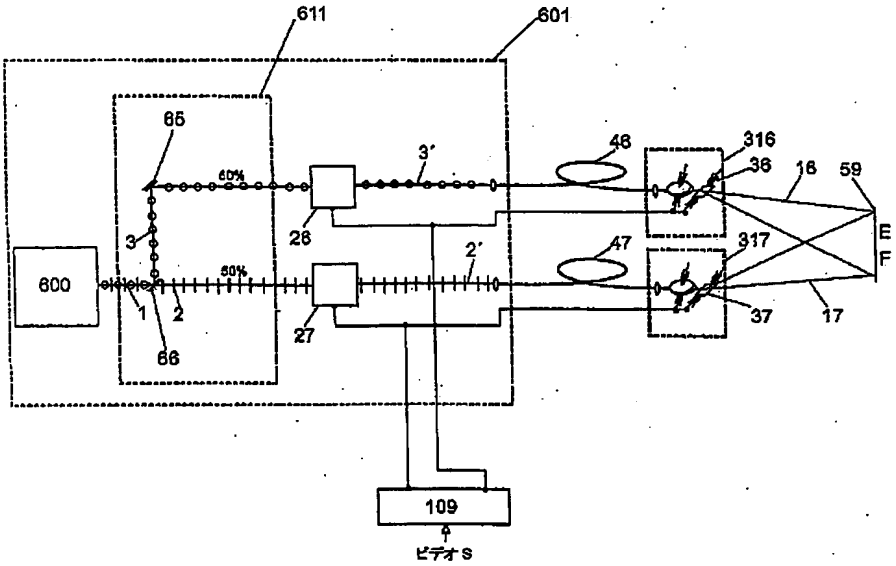
ビデオD

【図６】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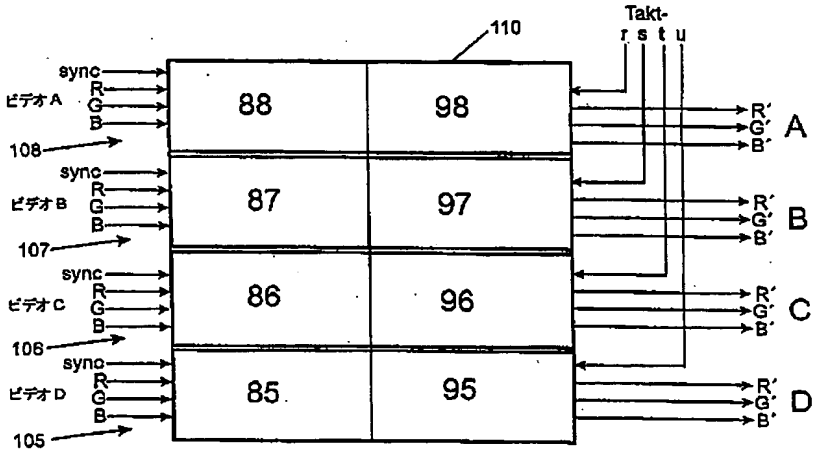
【図７】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